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# THE HEATING AND VENTILATING MAGAZINE

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Vol. XVI. No. 5
$2.00 a year. 20 cents a copy

MAY, 1919

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway



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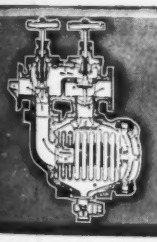
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THE HEATING AND VENTILATING MAGAZINE

MAY, 1919

# HEATING AND VENTILATING PLANTS AND MECHANICS' LIENS

A Review of Pertinent Appellate Court Decisions Defining the Circumstances Under Which the Security is Available.

By ARTHUR L. H. STREET.

No doubt it is generally understood by those engaged in the business of selling or installing heating and ventilating apparatus that circumstances very commonly afford the right to enforce a mechanic's lien for services rendered in such installation, or a materialman's lien for the agreed price of apparatus sold. But it is safe to say that it is not as generally understood just what important limitations the law imposes on the right.

This article is designed to aid readers of THE HEATING AND VENTILATING MAGAZINE in informing themselves on practical and important phases of the subject, bearing upon a choice between chattel mortgages or conditional sale contracts, on one hand and mechanics' leins, on the other hand as a a means of securing the payment of accounts.

First, it is to be remembered that mechanics' leins in this country are the creatures of statute, and that they can be enforced only upon the conditions prescribed by the legislatures of the several States. Then we must bear in mind that they are allowed only upon the theory that the work or materials for which a lien is claimed have been incorporated into a real estate improvement. This point furnishes the principal ground on which the right to a lien for furnishing or installing heating or ventilating apparatus has been contested.

Broadly speaking, it may be said to be now well-established law that a modern heating or ventilating plant constitutes such a permanent part of the building in which it is installed as to support a mechanic's lien claim. Yet some of the decisions cited below will show that a right of lien may be non-existent under particular circumstances. For example, it is competent for an owner and a contractor, dealer or manufacturer to treat equipment as remaining personal property, notwithstanding its attachment to real estate, the same as a building may by contract be treated as a chattel. So it is held by the courts that if the seller of a heating plant takes a chattel mortgage on it or reserves title to secure him in collection of the price, that action has the effect of treating the plant as personalty and no attempt can be made in such a case to enforce a mechanic's lien against the real estate benefited by the improvement. Or, as shown by the Illinois case cited below, equipment may be found to have retained character as a removable trade fixture, so that its installation

for use by a tenant may not support a mechanic's lien.

SELLER MUST CONTEMPLATE SPECIAL USE.

Another important qualification of the right of a seller of equipment to a lien, he having had nothing to do with the installation, exists under the established rule of law that if apparatus or materials are sold generally, without contemplation by the seller that they are to be installed in any particular building, there can be no valid lien. As recognized in a Kentucky decision hereinafter referred to, the seller must know when he delivers equipment that it is intended for a certain structure, although it is not necessary that he deliver the apparatus on the ground.

Deciding that a heating plant is to be regarded as a part of a building, a judge of the St. Louis Court of Appeals once aptly likened a furnace and its connections to vital organs of the human body. He said:

"The question was, not of furnace alone, but of a system of heating, ramifying all through the house, of which the furnace might be said to be the heart, and the air ducts and flues the lungs and arteries." (Case of Goodin vs. Elleardsville Hall Assn., referred to below.)

Since this utterance was made great strides have been taken in perfecting steam and hot water heating, so that the Missouri judge's simile is now even more appropriate than before, as steam and hot water may be more appropriately likened to blood in the veins and arteries than hot air can be.

The attitude of the courts on the subject of treating heating equipment as a legitimate part of real estate, the same as the brick chimney of a building is disclosed in some leading cases which we now proceed to review.

LAW STATED BY MASSACHUSETTS COURT.

In the case of Turner vs. Wentworth, 119 Massachusetts Reports, 459, the Massachusetts Supreme Judicial Court upheld the right of plaintiffs to enforce a mechanic's lien for furnaces installed in three houses as they were built by defendant, the Court said:

"If the transaction between the petitioners and the owner of the building was merely a sale by the former of the furnaces and ranges as personal property, they would have no lien upon the building in which they were put by the purchaser. But if by the contract of the parties the furnaces and ranges were to be furnished as parts of the several houses in which they were put; if it was the intention and understanding that they should be, and they were in fact, applied so as to constitute parts of the buildings, the petitioners would have a lien for them. They would be, within the statute, materials furnished and used in the erection of the buildings. There was competent evidence which would justify the finding that they were furnished under the contract, as parts of the buildings."

A NEW YORK DECISION.

In the New York case of Union Stove Works vs. Klingman, 20 Appellate Division Reports, 449, a lien was enforced to cover both the price of furnaces placed in apartment buildings in the course of construction and the value of the labor involved in the installation. Said the court:

"We agree with the trial court that the labor performed in setting the furnaces and ranges and the furnishing of such furnaces and ranges with the necessary pipes and appurtenances constituted labor performed and materials furnished in the erection of houses, within the meaning of the statute. The buildings for which these materials were furnished and on which the labor for which recovery was had was performed, were four five-story flats situated in the city of New York. They were built by the defendant for the purpose of sale, and they were subsequently sold, the furnaces and ranges passing into the possession of the purchaser as part of the structure. The furnaces were set in the cellars of the houses, and connected with the chimneys by stove pipes, and with the buildings by hot-air pipes running through the houses and to the different floors. The hot-air pipes, the furnishing of which constituted part of the entire contract, which included hot-air furnaces, Astor ranges, boilers

and attachments, and the value of which is included in the recovery in this action, were put in by the plaintiff while the buildings were in process of construction, and while the partitions were being built. They ran to registers on the different floors, and where the pipes were built into the partition the plaintiff furnished and put in iron, lath and tin. The ranges were equipped with warming closets, water backs, boilers, pipes, tubes and couplings, and were set into position on hearths provided for that purpose, and were connected with the chimneys by a smoke pipe; they were also connected with the water pipes running through the buildings by iron pipe connections screwed to the boilers. While it is true that some portion of the material, for which recovery has been had, could have been removed without difficulty, notably the ranges, the object of the erection of the buildings and the circumstances surrounding their purchase, and their annexation to the freehold, are sufficient to support the conclusion that it was the intent of the parties that they should be annexed to the realty and pass as fixtures. It is the general rule that fixtures of this character, whether actually or constructively annexed to the freehold, pass by conveyance or mortgage where there is nothing to indicate a contrary intention. * * *

"The cases cited by the appellant (Duffus v. Howard Furnace Co., 8 App. Div., 567, and Kerby v. Clapp, 15 id., 37) are not in point. In the Duffus case the furnaces, and in the Kerby case the ranges and heaters, were sold under a contract of conditional sale, which expressly provided that the property should remain the property of the seller until paid for. The only evidence of the intent of the parties was furnished by the agreement itself, and from that it appeared that both the vendor and vendee elected to treat and hold the articles as personal property even after they were annexed to the building."

### HEATING EQUIPMENT AS PART OF ARCHITECTURAL SCHEME.

In the case of Blanck vs. Commonwealth Amusement Corporation, 19 California Appellate Reports, 720, a lien was allowed for a gas furnace and gas connections and other articles installed in the construction of a building. The court said that the articles "were apparently necessary to the convenient use and occupation of the premises and were well within the architectural scheme of the building to which they were attached. This being so, they entitled the materialman to a lien just as much as would the plumbing, bathroom fixtures and other necessary fixtures of an ordinary dwelling."

And in a suit in which right to enforce a lien on account of the installation of a furnace in a church building ing was successfully asserted, the Nebraska Supreme Court said:

"A furnace when placed in a building becomes an appurtenance of the same and a mechanic's lien will attach thereto. (United States National Bank vs. Bonacum, 33 Nebraska Reports, 820.)

And, holding that a furnace installed in a dwelling house in the course of construction was subject to lien, a Buffalo court said in the case of Schwartz vs. Allen, 7 New York Supplement, 5:

"It seems too plain to require any discussion that the furnace set within the brick structure, and the connecting pipes and appurtenances were a part of the home, and that the same passed to the heir as a part of the realty, and that the contribution the plaintiffs so made to the construction of the house entitled them to a lien under the statute. It seems clear that the furnace and its connections constructed by the plaintiffs, were in fact, and by the the parties deemed to be a part of the house."

### AN OPINION OF THE MARYLAND COURT OF APPEALS.

Under a contract for the installation of heating equipment in each of twenty-three houses then being built by the same owners in Baltimore the Maryland Court of Appeals recognized the validity of liens asserted by the contractor in the case of Schaper vs.

Bibb, 71 Maryland Reports, 145, saying:

"For what purpose and with what intent were the range and fireplace heaters fitted in the house while in course of erection? As a general rule, it may be stated that whether a thing which may be a fixture becomes a part of the building by annexing it, depends upon the intention with which it is done. The character of the physical attachment, whether slight or otherwise, and the use, are mainly important in determining the question of intention of the part making the attachment or annexation. * * * Here there can be no doubt of the intention of Wilson and Company in fitting in the house, while in course of construction, the range and fire-place heaters, with their attachments. It was doubtless the purpose to put in these articles as permanent fixtures and as part and parcel of the finish of the house. The houses were built for sale or rent, and it was the manifest object to finish them in such modern and improved style, as to convenience and comfort, as would make them desirable residences. This could only be done by finishing the houses by fitting in ranges and fire-place heaters. And this is shown to be the universal understanding and practice among builders and material men in Baltimore. They all, that is, those called as witnesses, without exception, testify that not only is a cooking or kitchen range necessary, but fire-place heaters, with their attachments, are equally necessary, to the finish and completion of a modern dwelling house of the class to which that of the appellant belongs; and that such fixtures are regarded as being essential parts of the house. And that being so, there would seem to be no reason for holding that the range and heaters with their necessary attachments, were not materials furnished for or about the finish of the house.

"It is not contended, as we understand counsel for the appellant, that the lien does not exist for the range, and its accessories, and the work done in putting it up; but that the lien does not attach for the fire-place heaters and their attachments. It has been decided by this Court, in Webers v. Weatherby, et al., 34 Md., 656, that the right of lien does exist for both range and furnace erected in a house; and we think, for the same reason that the lien exists for range and furnace, it should exist for the heaters, pipes, registers, etc., fitted in the house as permanent fixtures."

### TWO POINTS DECIDED BY KENTUCKY COURT OF APPEALS.

A boiler furnished by the American Radiator Co. for a dwelling house was made the basis of a valid lien enforced against one Menne by the Kentucky Court of Appeals (150 Kentucky Reports, 151). The lien in this case was successfully claimed under a statute providing that one who performs labor or furnishes materials in the erection, alteration or repair of a house or other structure, or any fixture, machinery or other improvement in any manner of real estate, by contract with the owner, contractor, subcontractor, architect or authorized agent, shall have a lien on the real estate.

"Manifestly, the boiler, which is admittedly used in heating appellant's house, was material for repairing the house, as it supplied the place of the old one worn out, and it is also both a *fixture* and *machine*. But if so far improperly classified, in any event, there is no reason for saying it was not furnished for the *improvement in any manner* of the property. It certainly comes under the designation last mentioned for it is a permanent and necessary part of the building."

The second ground of attack made in this case against the validity of the lien rested on a claim by the owner of the property subjected to the lien that there was no sufficient proof that the boiler was furnished by the radiator company in contemplation of its use for any particular building. In other words, the owner sought to bring the case within the rule that no valid lien can exist where equipment is sold without any understanding on the part of the seller concerning the special structure in which it is to be installed. But the court found from the evidence

in the case that the radiator company was apprised as to the particular use for which this boiler was intended, and relied on its statutory lien as security from the very moment that the contract of sale was made.

*(To Be Continued)*

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# NOTES ON FIGURING RADIATION

## Method Suggested for Use in Buildings Served by Central Station Heating Systems.

BY PROFESSOR J. D. HOFFMAN.

EDITOR'S NOTE:—*The accompanying article constituted a report presented by Professor Hoffman to the Engineering Department of the Illinois Public Utilities Commission in connection with a review of the rate case of the Springfield Gas & Electric Company.*

This problem resolves itself into two parts; to determine first, how much heat is lost from the building (or room) per hour; and second, how many square feet of radiation must be installed in the building (or room) to make up the heat lost from the room. To obtain the best estimate for the *heat loss per hour* is one of the most uncertain problems that come to the heating engineer. Poor wall construction in itself may vary this determination from 50% to 100%; especially is this true in the type of construction commonly known as the frame and studded wall.

To find the heat conducted through any building material and lost through convection, substitute the values K from Table I in the general equation:

$$H = K A (t' - t_o)$$

where H=B.T.U. transmitted per square foot of surface per hour.

K=rate of transmission just mentioned.

A=square feet of exposed surface (wall, glass, ceiling, floor, etc.).

$t'$=temperature within the room (usually taken as 70° F.).

$t_o$=outside temperature, or temperature of adjoining cold room, hall, attic, basement, etc.

Assume for illustration a 15 ft. x 20 ft. x 9 ft. northwest corner, second-floor room, with 8-in. brick wall and three 21-sq. ft. windows. The number of square feet of net wall area is 252 and the heat loss through the wall on a zero day is

$H_w = 0.37 \times 252 (70 - 0) = 6527$ B.T.U.

The heat loss through the glass is

$H_g = 1 \times 63 (70 - 0) = 4410$ B.T.U.

The loss through the ceiling (floored attic) is, allowing an attic temperature of, say, 20°

$H_c = 0.25 \times 300 (70 - 20) = 3750$ B.T.U.

Leakage losses are usually taken in terms of room volumes, as for example:

| | Volumes. |
|---|---|
| Halls and corridors opening to outside air | 2 to 3 |
| Sitting rooms and rooms on the first floor | 1 to 2 |
| Sleeping rooms and rooms on the second floor | 1 |
| Store rooms | 1 to 2 |
| Offices | 2 |
| Churches and public assembly rooms | ¾ to 2 |
| Large rooms with small exposure | ½ to 1 |

The larger values in each case represent the poorer types of construction and the lower ceilings, and must be governed by the judgment of the estimator.

In estimating heat losses by leakage, assume 50 cu. ft. of air heated through one degree by one B. T. U.

Then the room mentioned above, being a second-floor sleeping room, may be taken as having one change of air per hour and

$$H_a = 2700 \times 70 \times 0.02 = 3780 \text{ B.T.U.}$$

The total heat loss from the room, therefore, of a south room which needs no exposure allowance, is

$$H_w = 6527$$
$$H_g = 4410$$
$$H_c = 3750$$
$$H_a = 3780$$
$$H = 18467 \text{ B.T.U.}$$

and adding 50% for a northwest exposure gives

$$H = 21237 \text{ B.T.U.}$$

The above may be stated as a

$$H = (KGt_xK'Wt_x + K''Ft_y + \text{etc.} + Qt_x)(1+a)$$

where K, K′ K″=rates of transmission for the various materials.
G=square feet of exposed glass surface.
W=square feet of exposed wall surface.
F=square feet of exposed floor or ceiling surface next an unheated space.
$t_x$=temperature difference $(t' - t_o)$
$t_y$=temperature difference between the room and any unheated space adjoining.
Leakage factor for each air change=0.02.
Q=volume of air leaving room per hour.
a=additions for exposure in per cent.

Applying this formula we have

$$H = (1 \times 63 \times 70 + 0.37 \times 252 \times 70 + 0.25 \times 300 \times 50 + 0.02 \times 2700 \times 70)(1 + 0.15) = 21237 \text{ B. T. U.}$$

The second part of the problem is to determine the amount of radiation to be installed, having given the heat loss H.

In estimating radiation from the foregoing rules and equations there is frequently an honest difference of opinion between the owner and the heating company as to whether certain portions of the building may not be exempted and not supplied with radiation. From the standpoint of the heating company, it is evident that if a building is under-radiated, the temperature within the building during severe weather fall below that usually specified, 70° F, and the heating company is censured unjustly. This creates dissatisfaction and is an undesirable state of affairs. It is also true that where heat is sold on a flat basis, radiators in one section of the building may be put to more than the maximum estimated service in heating certain other nearby sections of the building which are not equipped with

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FORMULAS FOR RADIATION.

**Low Pressure Gravity Steam Radiation, 1 to 3 Lbs. Gage.**

$$\text{Square feet} = R = \frac{\text{Heat Loss}}{1.7\,(220-70)} = \frac{H}{255};$$

$$\text{safe value } \frac{H}{250}$$

**Atmospheric Steam Radiation, 0 to 1 Lbs. gage, with separate trap at each radiator.**

$$R = \frac{\text{Heat loss}}{1.7\,(212-70)} = \frac{H}{241};$$

$$\text{safe value } \frac{H}{240}$$

**Atmospheric Steam Radiation, 0 to 1 Lbs. gage, with open return and receiver at end of line.**

$$R = \frac{\text{Heat loss} \times 1.15}{1.7\,(212-70)} =$$

$$\frac{H \times 1.15}{241} = \frac{H}{0.208}$$

**Hot Water Radiation with water temperature averaging 170° in radiation.**

$$R = \frac{\text{Heat loss}}{1.7\,(170\text{-}70)} = \frac{H}{170}$$

radiation and which may be partially heated by opening doors or passage ways between the two respective sections.

To illustrate, radiation is figured and heat sold on the basis of 70° air surrounding the radiator, with temperatures of the heating medium determined by the outside temperature. Now if room A is equipped with the necessary radiation to keep the room at 70° and a lower temperature is not objectionable to the patrons (a storage room or work room for example) an adjoining room B, which is not equipped with radiation, may be partially heated by opening door or passageways between them, with a corresponding drop in temperature of room A. When such conditions exist each square foot of radiation gives off more heat than that for which it was estimated and the company is not receiving sufficient pay for the heating service. In cases where heating service is paid by the meter rate, I can

TABLE 1—VALUES OF K

(The values shown are those considered by Professor Hoffman to represent the nearest actual service conditions.)

| Materials | K |
|---|---|
| Brick wall, 8½ in. plain | 0.37 |
| Brick wall, 13 in. plain | .29 |
| Brick wall, 17½ in. plain | .24 |
| Brick walll, 22 in. plain | .21 |
| Brick wall, 27 in. plain | .19 |
| Brick wall, furred and plastered, use 0.7 times non-furred. | |
| Stone wall, use 1.5 times brick wall. | |
| Concrete, 2 in. solid | .78 |
| Concrete, 3 in. solid | .71 |
| Concrete, 4 in. solid | .66 |
| Concrete, 6 in. solid | .56 |
| Frame wall (plaster, lath, stud, clapboard) | .50 |
| Frame wall (plaster, lath stud, sheathing, clapboard) | .28 |
| Frame wall (plaster, lath, stud, sheathing paper, clapboard) | .23 |
| Windows, single glass, full sash area | 1.00 |
| Plate glass | .90 |
| Windows, double glass, full sash area | .50 |
| Skylight, single glass, full sash area | 1.10 |
| Skylight, double glass, full sash area | .60 |
| Wooden door 1 in | .40 |
| Wooden door 2 in | .36 |
| Hollow tile, 2 in., ½ in plaster, both sides | .41 |
| Hollow tile, 4 in., ½ in. plaster, both sides | .33 |
| Hollow tile, 6 in., ½ in. plaster, both sides | .28 |
| Solid plaster partition, 2 in | .60 |
| Solid plaster partition, 3 in | .50 |
| Concrete floor on brick arch | .20 |
| Fireproof construction as flooring | .10 |
| Fireproof construction as ceiling | .14 |
| Single wood floor on brick arch | .15 |
| Double wood floor, plaster beneath | .15 |
| Wooden beams planked over, as flooring | .17 |
| Wooden beams planked over, as ceiling | .35 |
| Lath and plaster ceiling, no floor above | .62 |
| Lath and plaster ceiling, floor above | .25 |
| Steel ceiling, with floor above | .35 |
| Single ¾ in. floor, no plaster beneath | .45 |
| Single ¾ in. floor, plaster beneath | .26 |

TABLE 2—EXPOSURE ALLOWANCES.

| | Per cent. |
|---|---|
| North, northeast and northwest room heavily exposed | 10-20 |
| East or west rooms moderately exposed | 5-10 |
| Rooms 12 to 14½ ft. from floor to ceiling | 3 |
| Rooms 14½ to 18 ft. from floor to ceiling | 6 |
| Rooms 18 ft. and above from floor to ceiling | 10 |

see no actual financial loss to the heating company when radiation gives off more than the normal rated amount of heat.

Considering only the flat rate basis, it is my opinion that whether or not basement rooms or attic rooms fitted up as sleeping rooms are included is a question wholly for the patron to decide. A cold basement room, for example, will have a chilling effect upon the room or rooms on the first floor immediately above it. This lack of heat will be made up, however, in figuring in the floor loss, thus giving larger heat losses and larger radiation in these first floor rooms. Again, second floor rooms surmounted by finished attic rooms unheated, are not at a disadvantage, in fact such room may be a direct benefit in that the second floor rooms will probably have less heat loss than if there were no finished attic rooms above. Again, an unheated corridor need not be considered a source of heat loss to a heating company. Any unheated space (corridor, storage room, etc.), presents cold walls to the adjoining rooms and may be properly accounted for by increasing the radiation correspondingly in these adjoining rooms.

As a concluding statement I would recommend that the heating of basement and attic rooms be left to the discretion of the patron. That it is desirable from the standpoint of good service to heat all rooms in the building, including corridors, halls, storage rooms, etc., but that if there are rooms exempted, corresponding allowances will be made for extra radiation in all adjoining rooms.

# CHICAGO COMMISSION ON VENTILATION

## UTILIZATION OF WASTE HEAT OF TUNNELS

Test Made at Chicago State Hospital Using Hot Air from Pipe Tunnel System.

BY F. J. POSTEL,
State Supervising Engineer.

Where a group of buildings has to be supplied with steam and hot water from a central power plant, the usual and probably the most satisfactory method is to carry the pipes in service tunnels. Even though the steam and water piping is covered with high-grade pipe covering, the temperature of such tunnels is more frequently over 100° F. than under 100° F., especially as the size and number of steam pipes increase.

The tunnels are generally near the surface, in fact the concrete tunnel roof frequently serves as a sidewalk between the buildings. Under these conditions, it naturally follows that the heat lost by transmission through the walls, and especially through the roof of the tunnel, is considerable. The best visual evidence of this is the melted snow outlining the location of a tunnel system, even in very cold weather.

With a view of determining the feasibility of utilizing some of the waste heat of a tunnel system in heating and ventilating buildings, the following experiment was made.

At the Chicago State Hospital there is quite an elaborate system of tunnels connecting the various buildings on the grounds. The south end of this tunnel system is new and at present contains only a high-pressure steam line and a heating return line, the other service piping not having been installed as yet. The temperature

in this new tunnel is, therefore, considerably lower than that in the remainder of the tunnel system and is undoubtedly lower than the average temperature usually found in tunnel systems. However, due to the fact that one of the newer buildings served by this tunnel had a blast system already installed and that it was a comparatively simple matter to arrange the fan to draw its air supply from the tunnel instead of from outdoors, we selected this building for the test.

The primary purpose of the test was, of course, to get comparative data rather than merely to heat a particular building. Fig. 1 shows a front view of the building selected for the test and Fig. 2 shows the floor plan of the building. Fig. 3 shows its relative location on the tunnel system.

The building is designd to house about 100 patients. There is a large dormitory and a day room on the first floor and two dormitories on the second floor. The solarium at the south end of the building and the toilet rooms, attendants' rooms and the single rooms in the center of the building are heated by direct radiation, while the day rooms and dormitories are equipped with a blast system, in addition to direct radiation. The blast system has not been used for several years, the day rooms and dormitories being heated entirely by direct radiation and ventilated by open windows. In the test the direct radiation of the day rooms and dormitories was shut off entirely and the rooms heated by the blast system alone. The air was discharged into the room just as it was drawn from the tunnels, without reheating.

As the object of this test was primarily to determine how hot the rooms would get under certain outside temperature conditions and with a certain drop in tunnel temperature, no attempt was made to regulate the temperatures.

### LAYOUT OF TUNNEL.

Referring to Fig. 3, the tunnel between the skylight and point "A" is 4 ft. wide x 5½ ft. high and contains a 3-in high-pressure steam main covered with 85% magnesia 1 in. thick but with flanges uncovered, and also an uncovered 3-in. vacuum return main. From the hospital building to point "A" there is a tunnel 4 ft. high by 3 ft. wide containing a 2-in. high-pressure steam line covered with 1-in. 85% magnesia covering and a 3-in. uncovered vacuum return line. From point "A" to point "B", the tunnel is 4 ft. wide x 6½ ft. high and contains a 4-in. high-pressure steam line cov-

FIG. 1—BUILDING AT CHICAGO STATE HOSPITAL USED FOR TEST.

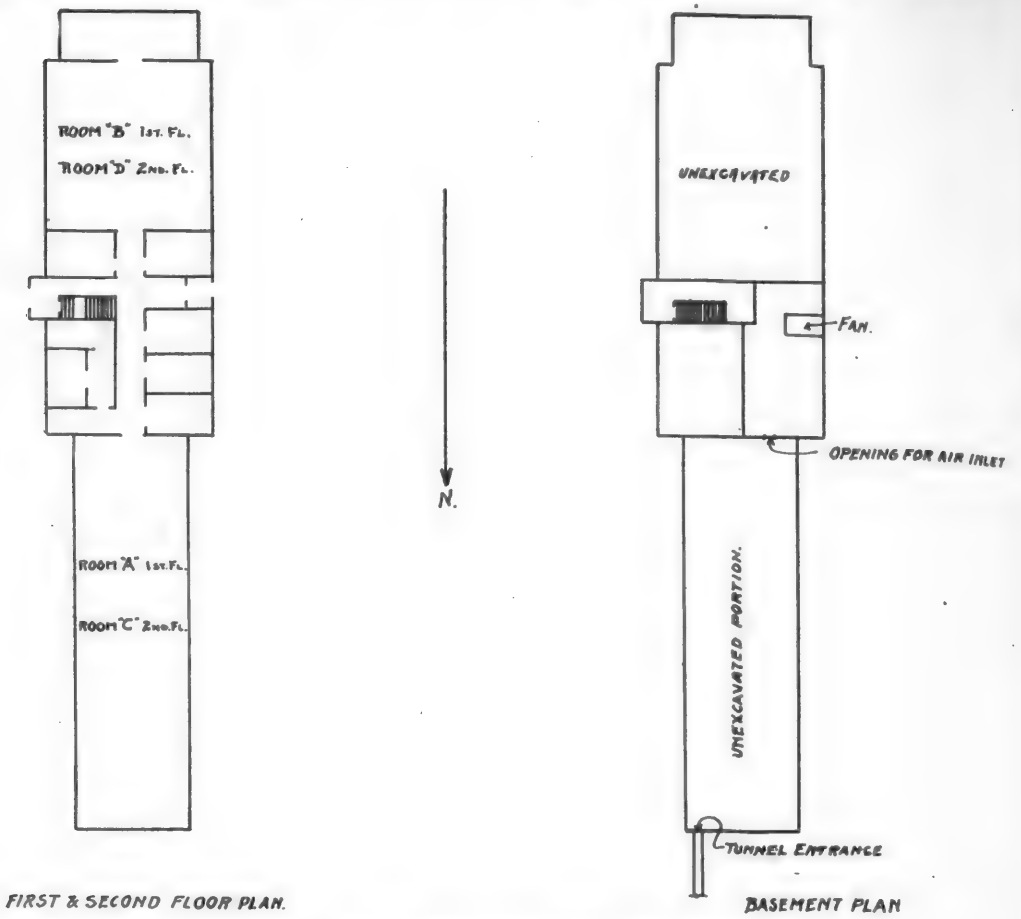


FIG. 2—DIAGRAM OF BUILDING USED FOR TEST.

ered with 1-in. 85% magnesia covering and an uncovered 4-in. vacuum return line. The tunnel from point "B" to the buildings under test is 3 ft. wide x 4 ft. high and contains a 2-in. high pressure steam line covered with 1-in. 85% magnesia covering and an uncovered 1½-in. vacuum return line.

There is an unexcavated space under the north end of the building between the tunnel entrance and the fan room, approximately 95 ft. long, through which runs the 2-in. high-pressure steam line and the uncovered 1½-in. return line. There is some uncovered steam pipe and a hot-water tank in the fan room which helps to heat the incoming air. That part of the tunnel from point "B" to point "C" is 425 ft. long and is 5 ft. wide x 5½ ft. high, contaning a 4-in. high-pressure steam line covered with 1-in. 85% magnesia covering and a 4-in. uncovered vacuum return line. As the air currents in this part of the tunnel are in the direction of the power house and away from the building under test, this section of the tunnel does not enter into the calculations.

Observations of the temperature and humidity, as well as the $CO_2$, dust count and bacteria were taken at three stations in the tunnel and four stations in the building. The observations were taken first with the entire building heated by direct radiation and, later, with the fan in operation and the direct radiation in the day rooms and dormitories shut off. The doors between the rooms heated by direct radiation and those heated by the blast system were kept closed.

The results before and after the fan was started are shown in the following table:

TEMPERATURE AND HUMIDITY OBSERVATIONS BEFORE AND AFTER STARTING FAN.

| | Temperature, Deg. F. | | Relative Humidity, Per Cent. | |
|---|---|---|---|---|
| | Before | After | Before | After |
| Tunnel "A" | 74 | 71 | 34 | 38 |
| Tunnel "B" | 80 | 78 | 44 | 46 |
| Tunnel "C" | 82 | 86 | 46 | 57 |
| Outdoors | 36 | 38 | 65 | 59 |
| Room "A" | 54 | 72 | 33 | 39 |
| Room "B" | 70 | 81 | 30 | 34 |
| Room "C" | 70 | 81 | 20 | 34 |
| Room "D" | 69 | 72 | 25 | 35 |

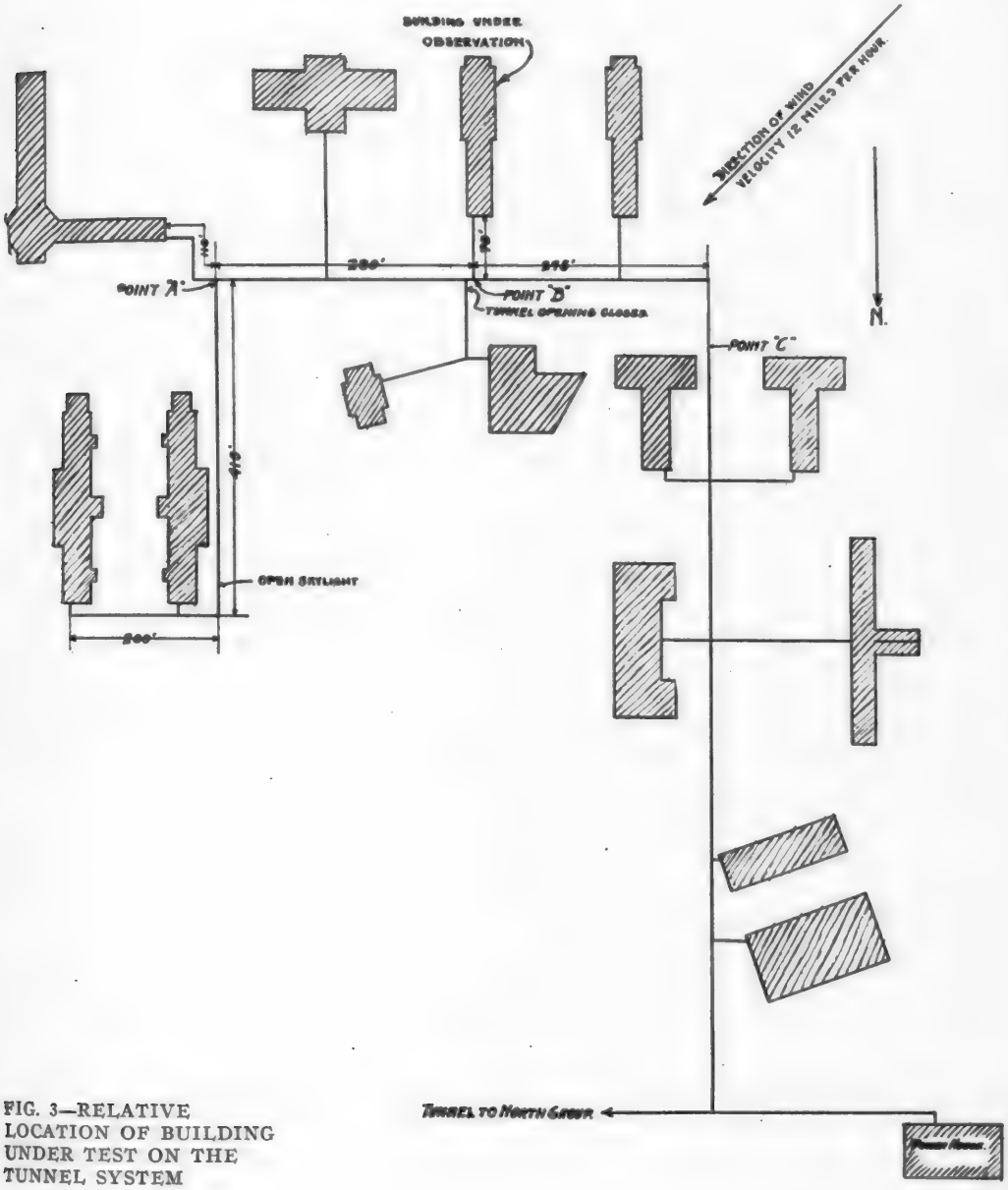


FIG. 3—RELATIVE LOCATION OF BUILDING UNDER TEST ON THE TUNNEL SYSTEM

The readings taken before the fan was started were taken about 1 p. m., March 11, 1919, and those taken after the fan was in operation were taken about four hours later.

After the fan was started it will be noted that there was a drop of 3° in temperature in the tunnel at point "A" and as the outdoor temperature had increased 2° we had a net equivalent drop in temperature of 5° at point "A" and 4° at point "B" but an increase of 6° at point "C". The air current at this time was from the skylight at point "A", to point "B" and through the tunnel of the building under test. Five feet to the right of point "B" there were no perceptible air currents. showing that at that point the suction of the fan in the building under test and of the power house chimney were balanced. From this point to point "C" infiltration of air through the skylights, etc., produces a slight current at point "C" in the direction of the power house. All the air used in the test was, therefore, heated from the outdoor temperature by passing into the tunnel at the skylight and through the tunnel to the building, absorbing heat from the tunnel walls and pipe and from the exposed tank and piping in the basement of the building.

It will be noted that the introduction of tunnel air into the rooms, resulted in a material increase in humidity. This may be accounted for by the moisture absorbed by the air in passing over the damp tunnel walls and by the steam escaping from expansion joints in the steam line which probably were not absolutely tight.

All samples taken at the point where the tunnel connected to the building and also in the center of the Day Room on the first floor showed the following results:

Amount of air delivered by fan 17,500 c.f.m. or about 12 changes per hour.

These tests show that the air conditions in the Day Room were quite satisfactory, especially considering the condition of the tunnel and the rather crude method of getting the air from the tunnel to the fan inlet. The tunnel had quite a bit of dirt and mud on the floor. From the tunnel entrance of the building to the fan room, the air passed through the unexcavated space under the north dormitory and while the air velocity was low, a certain amount of dust was undoubtedly picked up by the air in moving through this space. The dust count in the Day Room of 12,600 per cubic foot is not excessive, under these conditions. The $CO_2$ tests showed that the amount of air admitted to the building could be materially reduced and still maintain a reasonably good standard of ventilation.

As a practical proposition it would, of course, be necessary to install a thermostatically-controlled damper to proportion the amount of air drawn from outdoors and from the tunnel and also to install some humidifying device. In this way, the temperature and humidity could be maintained at any reasonable point.

RESULTS OF AIR TESTS AT TUNNEL ENTRANCE AND IN DAY ROOM.

| | Dust | Bacteria | $CO_2$ in 10,000 |
|---|---|---|---|
| | 26,000 | 4 | 4.3 |
| Tunnel entrance | 25,000 | 4 | 5.0 |
| | 17,000 | 6 | 6.7 |
| | 14,000 | | |
| Average | 20,500 | 4 | 5.3 |
| Day Room | 10,300 | 3 | 7.9 |
| | 14,900 | 6 | 7.0 |
| | | 0 | 6.0 |
| (25 occupants) Average | 12,600 | 6 | 6.8 |
| | | 4 | 6.9 |

RESULTS OF TEST.

The test proved conclusively:

1. That it is entirely practical to heat and ventilate buildings with waste heat from a tunnel system.

2. That with even a small amount of hot piping in a tunnel system insulated in the usual way, there is still sufficient waste heat to make its utilization well worth while.

3. That if the tunnels are kept reasonably clean, the air conditions in the rooms may be maintained at high standard of purity.

It follows, that as the temperature of the tunnels is decreased by this method, the heat loss through the tunnel walls and roof is decreased proportionately and to this extent it represents a direct saving.

Carrying this plan to its logical conclusion, it would appear that the limit to which we may safely go is reached only when the temperature of the tunnel gets down near the freezing point. The condensation in the steam mains will of course be increased, but the condensation in the heating coils of the blast systems will be reduced a like amount. The heat transmission through tunnel walls and roof is a direct measure of the heat wasted and this becomes a minor waste if the tunnel temperature is, let us say, 40° F.

What this saving may amount to in the larger institutions is shown by the fact that, based on the results of the above test, plans are now being made to heat four buildings similar to the one used for this test at the Chicago State Hospital.

# CENTRAL STATION HEATING

## DETERMINATION OF METER RATES FOR HEATING SERVICE

Elements to be Considered in Establishing a Proper Charge, With New Rate Formula.

BY WALTER J. KLINE.

The increasing cost of construction and operation of all public utilities, coupled with State regulation and the natural trend of industrial progress, have forced a healthy constructive analysis of their financial conditions. The fundamental purpose of State regulation is to insure justice to all so that the consumer may not be compelled to pay exorbitant or prohibitive charges for service and the company may not be deprived of profits to which it is justly entitled.

Frequently in times past, steam heating rates were arbitrarily assumed, or copied from some other city, regardless of the probably dissimilarity of conditions. Haphazard methods of "ratemaking" have been generally discarded and it is the purpose of this article to discuss the elements to be considered and the manner of establishing a proper charge for metered steam heating service.

FORM OF RATE.

There are a variety of forms of heating rates which may consist of the following elements, singly or in combination:

(1) A single price per 1,000 lbs: Practical in communities where diversity of consumption is not great.

(2) A "sliding scale," with decreasing price for increasing quantities:

Well suited to the average heating plant.

(3) A "two-part" rate consisting of a *"demand"* plus a commodity charge. The ultimate form of heating *rate*—due to increasing value per unit sold, cost of fuel, labor, etc.

(4) A minimum monthly charge for full "season." Should be a part of every rate.

(5) A minimum *season's* charge. This is not satisfactory.

(6) Discounts for prompt payment and penalties. Are the best "collectors"—should be a part of every heating "rate."

(7) A "coal clause" automatically decreasing or increasing the "base rate"—as the cost of coal per ton varies above or below limits not over 50c per ton apart.

RATE FORMULA.

The total income produced by a "rate" naturally must be sufficient to include operating expenses, fixed charges and dividends. Regardless of the form of a "rate," the final resultant is a net average price per 1,000 lbs. of steam sold (registered by customers' meters) and may be expressed by the following formula:

$$\frac{a+b+c+d+e+f}{\frac{Q}{1000}} = R \text{ cents per 1,000 lbs.}$$

This formula may be solved for any situation, by substituting the correct values for the various items, which are as follows:

Q—Total pounds steam sold per season.
a—Total steam production cost.
b—Distribution expense.
c—Commercial expense.
d—General expense.
e—Depreciation on investment.
f—Interest and dividends.

The quantity of steam "Q" on which a heating rate is based, should be determined from an advanced stage of development of the business, probably not less than 70% of the "possible" business, and at a normal and efficient rate of condensation. Thus the fixed investment and operating charges are equitably distributed.

(a) The production cost of steam will depend mainly upon the cost and quality of fuel, labor cost, and the design and equipment of the boiler plant itself. Only reasonably efficient steam production may properly enter into rate determination. A 60% *boiler* or thermal efficiency for the average plant is excellent. Station auxiliaries and blow-offs ought not to use more than 10% of generation, while 5% is good operation. A *plant* efficiency of 90% is, therefore, reasonable to expect, since less would show need of correction of conditions.

(b) Distribution expense comprises all meter reading, inspection and repair of street traps and up-keep of mains where necessary. Distribution efficiency depends on the quality of construction and insulation, and on rigid, regular inspection of apparatus in buildings to ensure correct registration of all condensation in customers' buildings. In a well constructed and operated distribution system, which is loaded to 70% or more of capacity, the steam registered by customers' meters should not be less than 85% to 90% of the "input" to the system. Thus 90% boiler plant efficiency x 85% steam distribution efficiency = 76½% "overall" efficiency, the minimum, which is fair for rate-making purposes. However, when applied to old plants 70% would be allowable.

(c) *Commercial expense* includes clerks, solicitors, rent, postage, stationery, etc.

(d) *General expense* includes management, legal expense, taxes, insurance, etc.

(e) *Depreciation* and amortization charges should be sufficient to provide for replacement at the termination of the period of useful life. In practice, limitations due to life of franchise and life of securities, makes it advisable to work on the basis of 20 to 25 years. On this principle, 3½% of "value of the property" compounded is ample depreciation charge for well-designed and

constructed underground systems, while 6% is fair for the boiler equipment.

The "value of the property" is readily obtained in the case of newly-constructed systems. The process is longer, and complicated in the case of the older plants, and frequently becomes a matter of litigation due to legal and engineering difference of opinion.

(f) The net *interest earning* which is permitted by State utility commissions, is never less than the legal rate of interest, nor more than 10% of the "value of the property," as a "going" concern.

For convenience, the formula is here repeated:

$$\frac{a+b+c+d+e+f}{\frac{Q}{1000}} =$$

"R" cents per 1,000 lbs. metered condensation

This result "R" is the simplest form of heating rate—and (where diversity of size of buildings and steam demand are not great) can be adopted in connection with a proper minimum monthly charge and prompt payment "penalty discount."

SLIDING SCALE RATES.

Because of temperature variation there is corresponding variation in the amount of heat required each month. Where the average temperature for eight months is about 40° F., the monthly "heat" requirements are approximately the following percentages of the total:

| | |
|---|---|
| October, | 5% |
| November, | 10% |
| December, | 15% |
| January, | 20% |
| February, | 20% |
| March, | 15% |
| April, | 10% |
| May, | 5% |

*Fixed Charges* on investment and fixed operating expenses are practically uniform during each of the eight months. Since the consumer's income is generally constant, it therefore appears desirable to equalize the monthly cost of heating. This is accomplished by the sliding scale of rates or decreasing unit prices for increasing quantities used. This is founded on the fact that the *cost of operation per unit decreases as quantity increases.* This principle applies not only to quantity due to temperature, but quantity due to connected load or size of building.

The following tabulation illustrates the characteristics of heating operation with the resultant change of price to produce monthly expenses (coal @ $6.25 per ton).

Therefore, if fixed charges are to be earned each month, it will be necessary to sell

| | | | | |
|---|---|---|---|---|
| 10% | of total steam | @ | $2.12 | per 1,000 lbs. |
| 20% | of total steam | @ | 1.34 | per 1,000 lbs. |
| 30% | of total steam | @ | 1.08 | per 1,000 lbs. |
| 40% | of total steam | @ | 0.96 | per 1,000 lbs. |

| Month | Per cent of Season | Pounds of Steam Required, Customers' Meters etc. | Fixed Charges, Interest, Depreciation Line Losses Taxes, Ins., Management Salaries, | Cost of Steam, Including Fuel, Water, Labor, Supplies, Maintenance | Total Cost of Heating Service | Cost per 1000 Lbs. $A \times \frac{D}{\frac{1}{1000}}$ |
|---|---|---|---|---|---|---|
| Oct. | 5 | 1,900,000 | $2,956.00 | $1,070.00 | $4,026.00 | $2.12 |
| Nov. | 10 | 3,800,000 | 2,956.00 | 2,140.00 | 5,096.00 | 1.34 |
| Dec. | 15 | 5,700,000 | 2,956.00 | 3,210.00 | 6,166.00 | 1.08 |
| Jan. | 20 | 7,600,000 | 2,956.00 | 4,280.00 | 7,236.00 | .96 |
| Feb. | 20 | 7,600,000 | 2,956.00 | 4,280.00 | 7,236.00 | .96 |
| Mar. | 15. | 5,700,000 | 2,956.00 | 3,210.00 | 6,166.00 | 1.08 |
| Apr. | 10 | 3,800,000 | 2,956.00 | 2,140.00 | 5,096.00 | 1.34 |
| May | 5 | 1,900,000 | 2,956.00 | 1.070.00 | 4,026.00 | 2.12 |
| Total | 100 | 38,000,000 | $23,648.00 | $21,400.00 | $45,048.00 | $1.1888 |

If all customers were the same size, the determination of the "steps" in the sliding scale rate would be simple. This is seldom even approximately true, and therefore the next step is to classify the total number of bills during the heating season according to size, to determine the number, total condensation and per cent of season in each group. In the example just cited, the variation in bills is as follows:

| Size of Bills | No. of Bills | Season's Steam Lbs. | Approx. per cent of Total | Avg. Bill Lbs. Condensation |
|---|---|---|---|---|
| Not over 10,000 Lbs. | 207 | 1,920,000 | 5½ | 9,300 |
| Over 10,000 less than 20,000 | 307 | 5,990,000 | 15¾ | 19,500 |
| Over 20,000 less than 30,000 | 190 | 5,600,000 | 14¾ | 29,500 |
| Over 30,000 less than 40,000 | 104 | 4,160,000 | 11 | 40,000 |
| Over 40,000 less than 50,000 | 54 | 2,700,000 | 7 | 50,000 |
| Over 50,000 less than 60,000 | 29 | 1,740,000 | 4½ | 60,000 |
| Over 60,000 less than 70,000 | 19 | 1,330,000 | 3½ | 70,000 |
| Over 70,000 less than 80,000 | 14 | 1,120,000 | 3 | 80,000 |
| Over 80,000 less than 90,000 | 6 | 540,000 | 1½ | 90,000 |
| Over 90,000 less than 100,000 | 17 | 1,700,000 | 4½ | 100,000 |
| Over 100,000 less than 200,000 | 33 | 5,200,000 | 13½ | 158,000 |
| Over 200,000 less than 300,000 | 20 | 6,000,000 | 15¾ | 300,000 |

Based on an examination of the foregoing, disregarding "psychology" and other conditions, the following rate produces the desired result.

| | | |
|---|---|---|
| 1st | 4,000 lbs. any month | $2.15 per 1,000 lbs. |
| Next | 8,000 lbs. any month | 1.35 per 1,000 lbs. |
| Next | 12,000 lbs. any month | 1.10 per 1,000 lbs. |
| Next | 16,000 lbs. any month | 1.00 per 1,000 lbs. |
| All over | 40,000 lbs. any month | .95 per 1,000 lbs. |

Penalty of 5% if not paid by 10th. Minimum monthly bill based on "size of buildings."

Rate based on coal at $6.25 per ton. To be increased or decreased 1c per 1,000 lbs. for each 10c per ton cost above $6.50 or below $6.00 per ton.

Applying this rate, the following "net averages" and "group incomes" appear:

The average bill in each group is actually less than the amount used in the calculation. This would result in a slightly higher average rate than that stated above, and will equalize slight discrepancy in the total.

In actual practice, it will be necessary to arbitrarily modify the early steps of the rate, gaining the same result by having larger "blocks," at lower average prices.

"TWO PART" RATES.

It is the writer's opinion that in the future the majority of heating rates will consist of a fixed service charge, plus a commodity charge for consumption. The reason for this is that with present operating costs, the value per unit sold is large and the consequent loss equally so if only part registration is obtained.

(1) Fixed investment charges, interest depreciation and fixed operating charges, if desired, can be proportioned among the heating consumers on the basis of the relative cubic contents of buildings heated, or by the square feet of radiation calculated by a "master formula." Then each individual case can be divided into equal monthly payments.

(2) The commodity charge consists of the unit manufacturing cost of steam of a 70% developed plant at

| | | Av. Rate | Condensation | Revenue |
|---|---|---|---|---|
| Bills of | 10,000 lbs. $ 16.70 | 1.67 per M | x 1920 M | $3,210.00 |
| Bills of | 20,000 lbs. 28.20 | 1.41 per M | x 5990 M | 8,450.00 |
| Bills of | 30,000 lbs. 38.30 | 1.28 per M | x 5600 M | 7,180.00 |
| Bills of | 40,000 lbs. 48.60 | 1.21 per M | x 4160 M | 4,950.00 |
| Bills of | 50,000 lbs. 58.10 | 1.16 per M | x 2700 M | 3,130.00 |
| Bills of | 100,000 lbs. 105.60 | 1.056 per M | x 6543 M | 6,900.00 |
| Bills of | 200,000 lbs. 200.60 | 1.000 per M | x 5200 M | 5,200.00 |
| Bills of | 300,000 lbs. 295.60 | .985 per M | x 6000 M | 5,910.00 |
| | | | Income | $44,930.00 |

least (including distribution losses), plus a reasonable manufacturing profit. This unit cost applied to the monthly condensation in each case, plus the "fixed charges," equals the monthly bill for SERVICE. Thus, the consumer pays his just proportion of the fixed charges due to connected load demand and purchases the steam used at close to the cost of manufacture, while the company is assured of its cost of operation and a fair return on its investment, independent of the temperature.

A substantial discount or penalty for prompt payment should be provided in every heating rate. It is the best collector of bills, and is only compensation for extra expense of operation, when its use is applied.

It is hoped that the foregoing will help to determine rates for new plants, or assist in the revision of rates for old plants, by bringing to mind the elements involved and a general method of procedure.

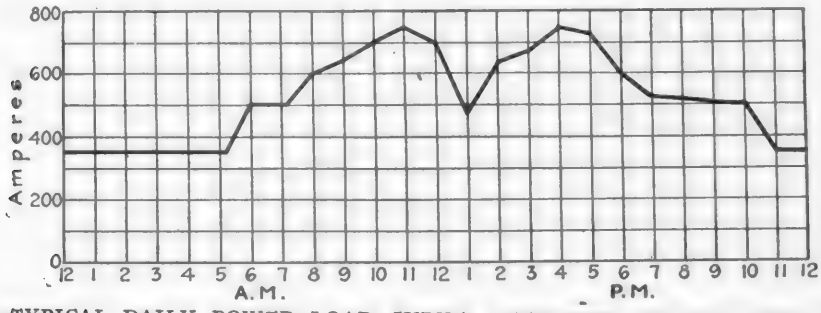


FIG. 1—TYPICAL DAILY POWER LOAD CURVE, DECEMBER, STATE CAPITOL POWER PLANT, MADISON, WIS.

### Why Power May be Considered as a By-Product in a Combination Power and Heating Plant.

One of the statements made by John C. White, State power plant engineer for Wisconsin, in a recent discussion of central station heating (Bureau of Mines Technical Paper 191), was that where the heating load is large enough to entirely submerge the power load, there will be no peaks in the boiler-room through variations in the power load. The power requirements, he said, may vary from zero to maximum and the fireman will not know it unless some one tells him or he consults the records. When the engines are exhausting their maximum into the heating system, the reducing valves will automatically cut the supply of live steam to the required amount. When the power load is a minimum they will open and supply live steam to meet the requirements.

Mr. White illustrated his point by presenting curves taken from the records of the State capitol power plant at Madison, Wis.

Fig. 1 is a typical daily power-load curve which shows a variation of over 100% in current output.

Fig. 2 is a daily feed-water chart, no evidence of the variation in the power load being discernible in it. Fig. 3 is a feed-water record of the day before that of Fig. 2. This record shows the effect on the feed-water rate of changing from simple non-condensing engines to compound condensing engines. The heat thus wasted to the sewer costs about $15.00 a day for 24 hrs. for each 100 kilowatt output. The engine is a compound condensing Corliss with an economy of about 14 lbs. of steam per indicated horse-power per hour.

Fig. 4 is a curve showing the relation of coal burned to temperatures. Ordinarily no heating is done from June 15 to September 15. The fuel used during that period is all chargeable to electric service, pumping and steam for other uses. Compound condensing engines are used where no heating is required.

The graphical data mentioned are from the records for 1911. Figs. 5 and 6 are from the records for December 29 and 30, 1917, the charts being removed at 7 a. m. on those dates. It will be noted that the loads are much heavier and that the quantities are therefore greater, the reason being that in 1911 only part of the new capitol at Madison was in use, whereas in 1917 the building was completed and full service was being given.

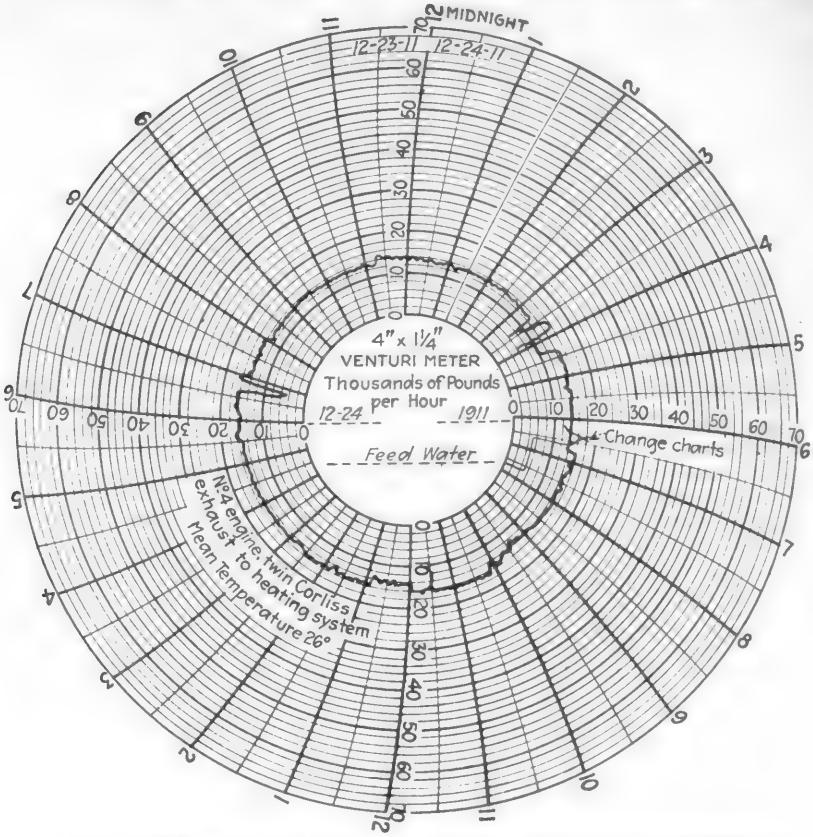


FIG. 2—AVERAGE DAILY FEED-WATER RECORD, DECEMBER.

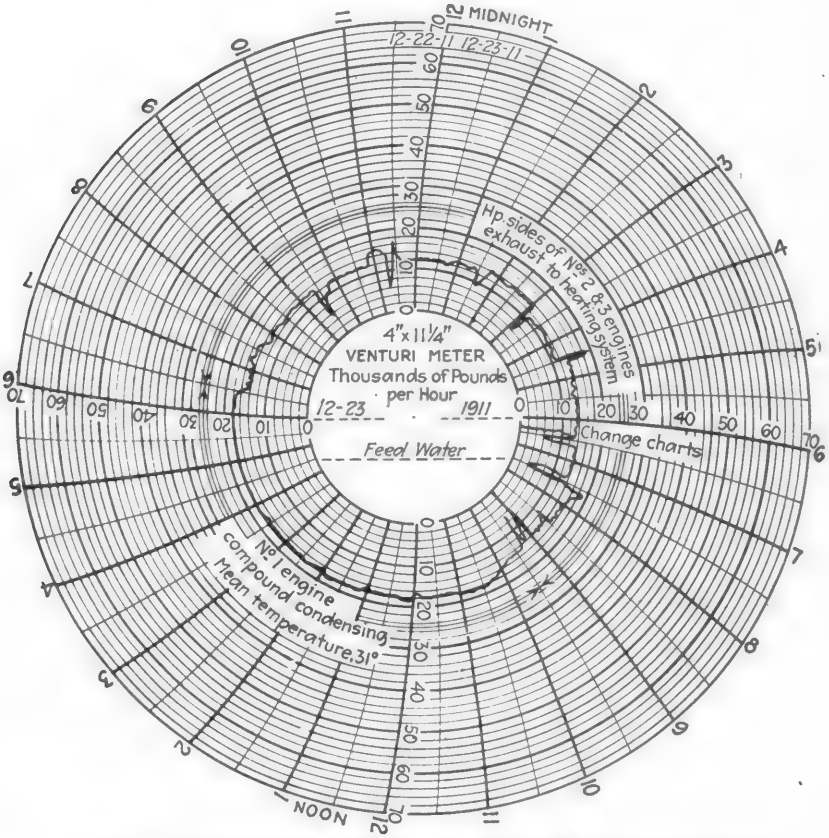


FIG. 3—FEED-WATER RECORD OF DAY BEFORE, SHOWING EFFECT OF CHANGING ENGINES

Fig. 5 was obtained to show the effect of the ventilating equipment on the heating loads. The fans were running from 6 a. m. to 12 m., when they were stopped. The feed-water rate dropped about 5,000 lbs. an hour at that time. The electrical load also dropped about 500 amperes because of the fan motors being cut out and because of the normal noon-time drop due to other reasons. Later on it increased again until closing time at 5 p. m. The feed-water rate shows little difference accountable through any change in the power load, the latter being submerged at all times; in addition to the exhaust steam available, live steam was required for the heating load during the entire 24 hours.

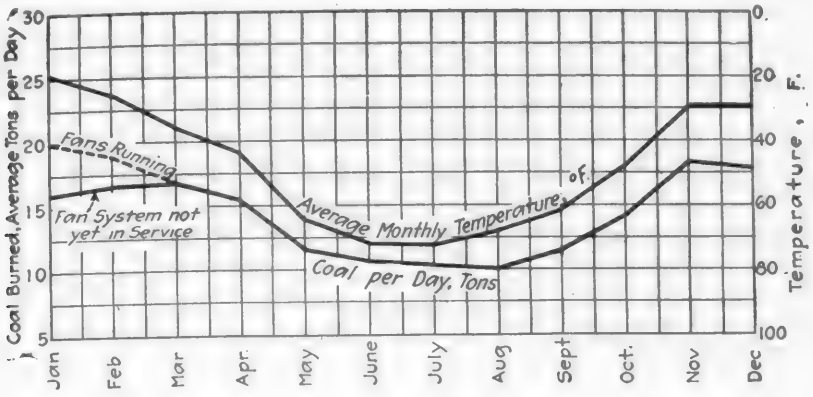


FIG. 4—RELATION OF FUEL BURNED TO TEMPERATURES, 1911.

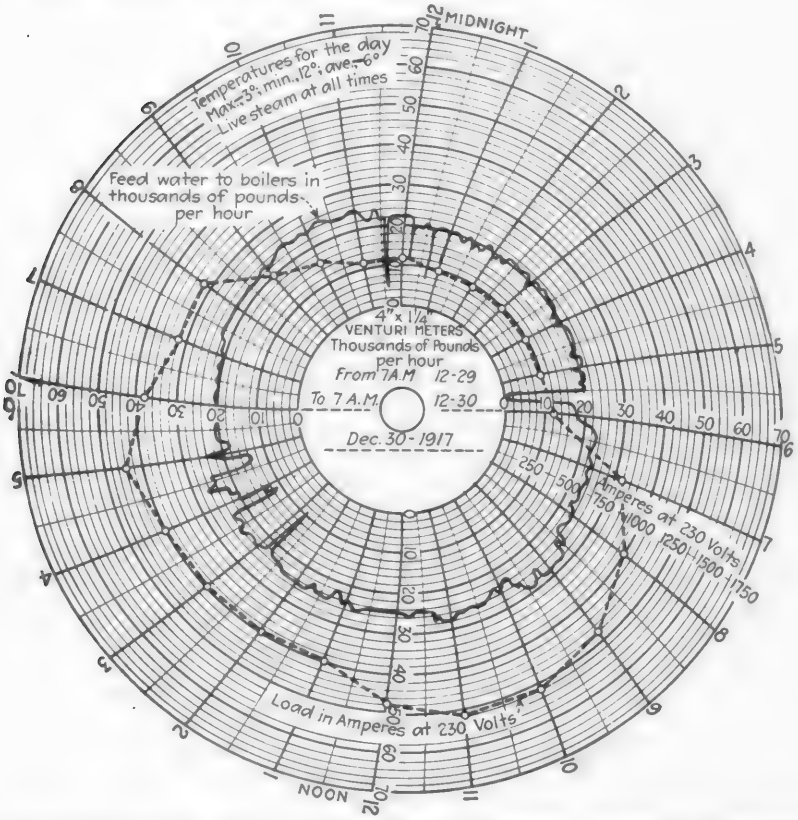
MIDNIGHT
NOON
Temperatures for the day
Max.-3°, min.-12°, ave.-6°
Live steam at all times
Feed water to boilers in thousands of pounds per hour
4" x 1/4" VENTURI METERS
Thousands of Pounds per hour
From 7 A.M. 12-29
To 7 A.M. 12-30
Dec. 30-1917
Amperes at 230 Volts
Load in Amperes at 230 Volts

FIG. 5—FEED-WATER AND LOAD RECORD, SHOWING EFFECT OF RUNNING VENTILATING EQUIPMENT.

Fig. 6 is the record for the following day and confirms the previous record, the only essential difference being that it was Sat-

urday and most of the offices were closed in the afternon, thus reducing the power requirements. The temperatures for the two days were practically the same. From

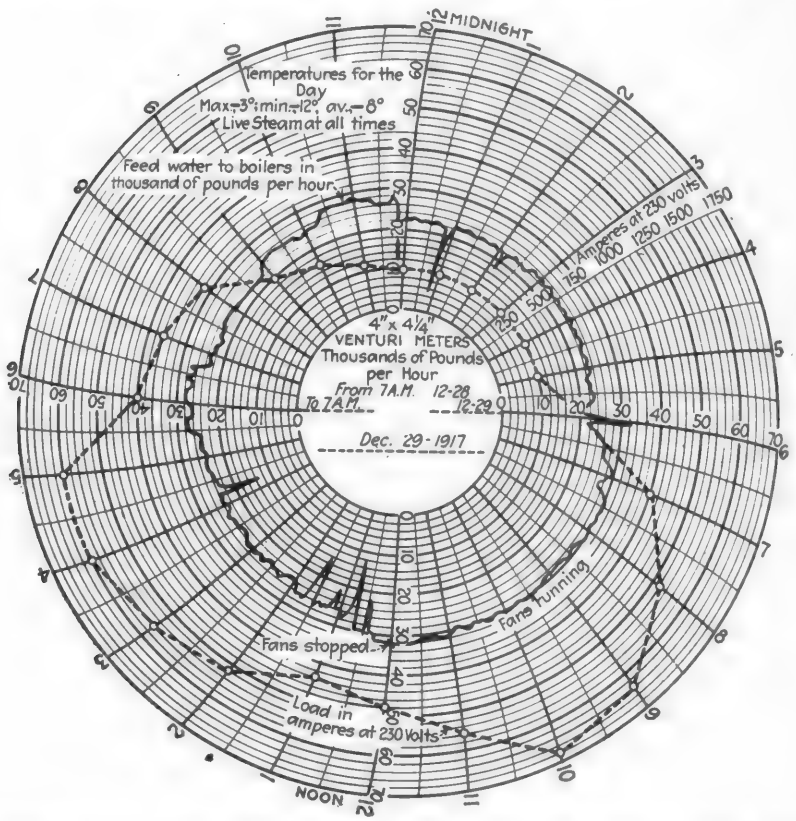


FIG. 6—FEED-WATER AND LOAD RECORD FOR DAY THAT WAS A HALF HOLIDAY

150 to 250 amperes of the electrical load from 7 a. m. to 9 p. m. are used for cooking, heating water, etc., in the capitol restaurant. This heat for the restaurant could be supplied much more cheaply by other means, and, although the consequent fuel expense is negligible in severe weather, it becomes a direct expense when the heating load is light. Where steam and gas are avilable the use of electric current to produce heat should be discouraged, except for special requirements.

CORELATIONS OF LOADS.

The relation of loads, as disclosed by these records, have an important bearing on the subject of central station heating. They show that when the heating load is made large enough to give constant conditions in the boiler room, the efficiency there is decidedly increased and the power output becomes a matter of secondary importance as far as cost of operation is concerned. Although for commercial reasons, the keeping of the station load factor for power as high as possible is desirable, peaks and variations of any magnitude within the range of the boiler capacity can be handled with a minimum of trouble and expense.

## Division of Values Between Electrical and Heating Departments.

The method used by the Illinois Utilities Commission in allocating the physical properties of central station heating companies and the division of the operating expenses between the electrical and heating departments, was endorsed recently by Professor J. D. Hoffman in the course of his expert testimony before the commission.

According to this method the engineer of the commission allocated the physical properties upon the basis of "maximum demand," that is, all valuations of common properties were divided with respect to the proportion each utility demanded its use at maximum service. As an illustration, said

Professor Hoffman, suppose there are twelve boilers of equal capacity in the combined plant; also that six of these would be needed at the peak heating load as a direct heating proposition and eight would be needed at the peak load when operating purely as an electric generating station. On this basis the total boiler valuations would be divided 6-14 to heating and 8-14 to electricity. (The above values are hypothetical and used for illustration only.) Further, if it were found by meter and otherwise that 40% of the total heat delivered to the heating system was given to the hot water system and 60% to the steam heating system, then of the 6-14 of the total valuation of the boiler plant 40% would be charged against the hot water system and 60% against the steam system. That division which best represents the boiler plant will also serve for most of the other combined apparatus, such as pumps, chimneys, coal and ash-handling machinery, etc. Equipment and apparatus whose division of utility is different from that of the boilers, must be divided according to the best judgment of the valuation engineers.

The generating expense was also apportioned very nearly to the "additional cost" basis, that is, expense of combined operation above that necessary to produce the electric current when running as an electric generating plant, is charged against the heating system. In the case that was up for consideration (the rate case of the Springfield Gas & Electric Company) the base cost of electric generation per kilowatt was estimated during a summer month when the plant was in normal condensing operation. The summer base cost was then corrected to agree with the heating season operation which is theoretically in favor of slightly higher generating efficiency.

In addition to endorsing the methods of the commission, Professor Hoffman gave it as his opinion that the additional cost basis of operating costs was, in this case, the best. There may be combination plants, he added, where the strict application of this basis of division would do an injustice to the heating district, especially those plants where the cost of electric production is so low as to practically make the heating a direct fire proposition. In such cases some combination plan would have to be worked out to do justice to each utility. It was his opinion that no method of apportionment yet brought forward can be universally applied.

A division which might be regarded as more nearly ideal, he said, could be made if there were available data concerning the amount of exhaust steam delivered per day to each of the two heating systems during a part or all of one heating season.

### Items to be Considered in Fixing a Heating Rate.

The items entering into the determination of a rate for central station heating service were given as follows by Professor J. D. Hoffman, during his testimony in a recent case before the Illinois Utilities Commission:

(a) Fixed charges, such as interest, depreciation, insurance and taxes, based upon the valuation of the plant and equipment.

(b) Operating expense, including fuel, supplies, labor, management and office expense.

Fixed charges, he said, are controlled by the size and capacity of the plant and these, in turn, are governed by the amount of radiation connected in the district. Operating expenses are more flexible and while not in direct proportion to the severity of the heating season, are yet a function of it.

Taking up the flate rate and meter rate methods of charging, Professor Hoffman stated that, for water heating, he believed the square feet of radiation basis was the only one to be considered, due to the lack of a satisfactory water meter for this purpose. The rate should be based, he said, upon a flate rate found by dividing the total fixed and operating charges of the plant by the total radiation attached. The fixed charges to include interest and depreciation on the investment.

Steam rates, he said, may be determined upon the flat rate basis or by any one of a number of meter rates based upon the condensation of 1000 lbs. of steam as the unit. Some of these are:

(a) A rate for each 1000 lbs. of steam, straight.

(b) A graduated scale of rates:
For the first a x 1000 lbs. of steam.
For the next b x 1000 lbs. of steam.
For the next c x 1000 lbs. of steam, etc.

(c) A certain fixed charge plus a certain uniform or graduated operating charge, the fixed charge being a guarantee to the company for a minimum cost in looking after the service, as well as a guarantee for a maximum reserve capacity in the plant.

Of the three meter rate bases for steam, Professor Hoffman believed the third to be the most equitable to all parties concerned. This rate base with a uniform operating charge, termed the "fixed rate plus" method is also recommended by the Illinois Utilities Commission.

THE HEATING AND VENTILATING MAGAZINE

A Monthly Journal of Engineering Progress

*Member of the Associated Business Papers Inc.*
*Member Audit Bureau of Circulations.*

Vol. 16 May, 1919 No. 5

Published Monthly at Cooperstown, N. Y. by the
**Heating and Ventilating Magazine Co.**
Executive and Editorial Offices, 1123 Broadway
New York

A. S. ARMANAC ..... *President*
GUSTAVE PETERSEN ....*Secretary and Treasurer*

A. S. ARMAGNAC, Editor
GUSTAVE PETERSEN, Business Manager

European Representative
W. G. HOLLINGWORTH, 304 High Holborn:
London, W. C.

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|---|---|
| Subscription | $2.00 per year |
| Canada | 2.25 " " |
| Foreign Countries | 2.50 " " |
| Back numbers | 25 cents each |

AN INTERESTING line of thought is prompted by the following suggestion, received from a Middle West correspondent:

"I know of no better medium than your journal to secure the wiping out of the phrase, 'hot water heating.' For many years all our advertisements and literature say 'steam and water heating.'"

We heartily approve of this suggestion. There is, of course, no more reason why we should say "hot water heating" than we should say "hot steam heating," and yet it is not uncommon to hear engineers talk about "hot blast heating" and "hot air heating."

It is always a difficult matter to root up established usages in any field. It is particularly true in the heating field because until recent years the art of heating has been surrounded by some of the most carefully-nurtured prejudices and more or less inaccurate premises of any engineering line. It is not so long ago that heating men pinned their faith to the carbon dioxide test as the one infallible means of determining the fitness of air for breathing purposes. Everyone can remember the time when the location of exhaust air outlets near the floor line was considered standard practice.

In the matter of engineering and trade terms it seeems that the heating industry has gone out of its way to select those that are either misnomers or are at least redundant in their meaning. The word "radiator" is a case in point. If we had to depend on the radiant action of the so-called radiator, we should soon freeze to death. "Hot blast heating" is of more recent growth and it is gratifying to find that this term has already given way in many quarters to "blast heating." "Furnaces" long since became "hot air furnaces" to distinguish them from other kinds used in power work, and a further refinement, among those accustomed to accurate expression, is the expression "warm air heaters." There is, perhaps, some excuse for this distinction although to be entirely logical we presume "air heaters" should be the proper phrase.

No doubt other instances of incorrect phraseology will occur to our readers and we should be glad to continue the discussion in subsequent issues. Now that the trade has a research bureau it might well begin its labors by standardizing the terms and phrases used in heating and ventilating work. For our part we have no hesitation in offering "water heating" as a substitute for "hot water heating" and, unless force of habit proves too strong, will establish its use as far as THE HEATING AND VENTILATING MAGAZINE is concerned.

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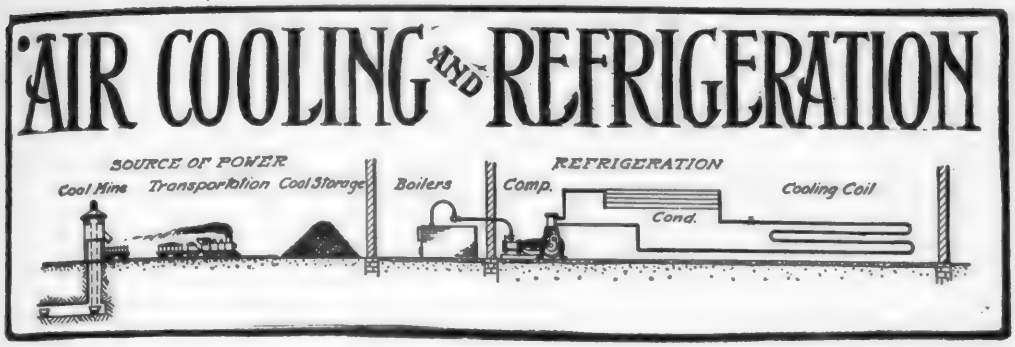
WE ANNOUNCE the addition, in this number of a new department on "Wrinkles" for the heating and ventilating engineer. This will be supplemented shortly by a department designed especially for the younger and less experienced engineer.




# ARRANGEMENT OF SYSTEM FOR COOLING DRINKING WATER

The accompanying description may be found useful in designing a cooled drinking water system to and from a number of drinking water fountains. In the system shown the arrangement provides for four fountains.

A diagrammatic arrangement of the system is shown in Fig. 1. From the tank the water falls by gravity and passes through the refrigerator, where it is cooled. The pump takes its suction from this refrigerator or ice box and discharges the cooled water to the drinking fountains and to the overhead gravity tank. In this way the cooled water is continuously circulated past the fountains

The circulating pump is of the single-acting, triplex plunger type, size 1¼-in. x 2 in., mounted on a cast-iron bedplate integral with that of a ½-H. P. alternating-current motor, belt-driven and equipped with an adjustable idler.

Piping from the drinking fountains is laid in the ground under the floor of the building and is of brass pipe, covered with Nonpareil cork insulation, painted

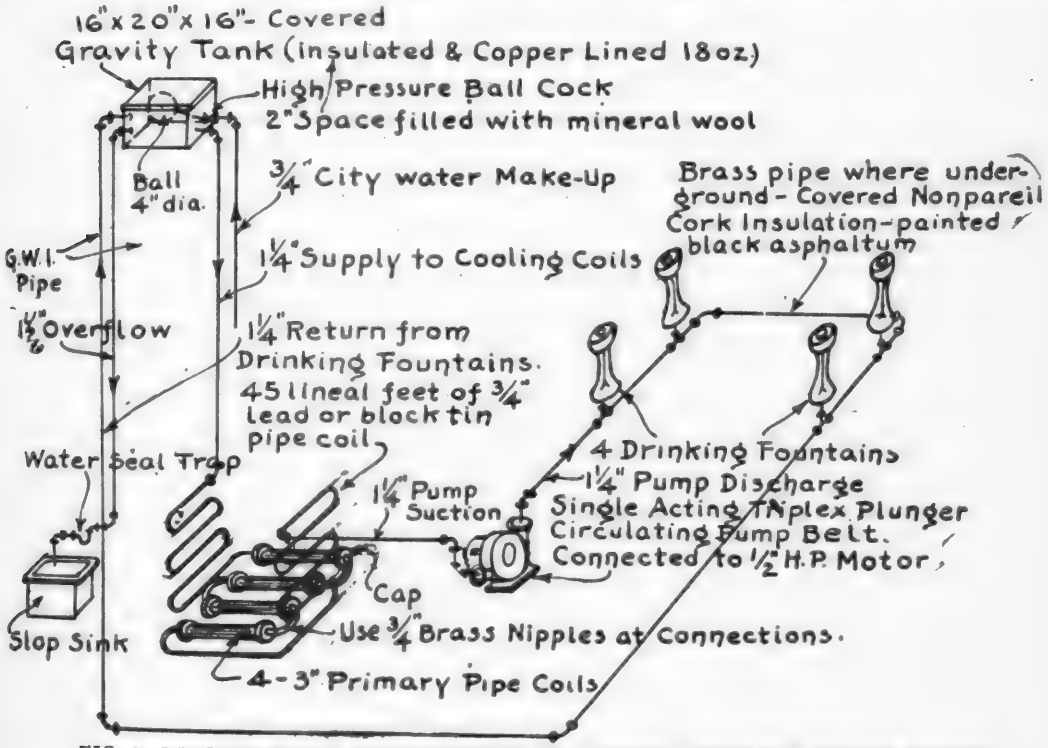

16"x20"x16"- Covered
Gravity Tank (insulated & Copper Lined 18oz)
High Pressure Ball Cock
2" Space filled with mineral wool
Ball 4" dia.
¾" City water Make-Up
Brass pipe where underground - Covered Nonpareil Cork Insulation - painted black asphaltum
G.W.I. Pipe
1¼" Supply to Cooling Coils
1½" Overflow
1¼" Return from Drinking Fountains.
45 lineal feet of ¾" lead or block tin pipe coil
Water Seal Trap
4 Drinking Fountains
1¼" Pump Discharge
1¼" Pump Suction
Single Acting Triplex Plunger Circulating Pump Belt. Connected to ½ H.P. Motor
Cap
Slop Sink
Use ¾" Brass Nipples at Connections.
4-3" Primary Pipe Coils

FIG. 1—DIAGRAMMATIC ARRANGEMENT OF COOLED DRINKING WATER SYSTEM.

black asphaltum. All the other pipes, except those of lead or block tin in the refrigerator, are of wrought-iron, galvanized. The gravity tank is provided with a ¾-in. city water make-up and high-pressure ball cock, also a 1½-in. overflow, with open end above the slop sink. The other pipes are 1¼-in. in size.

A water-sealed trap is installed in the overflow pipe to prevent the entry of warm air into the gravity tank. Piping in the refrigerator is arranged as a circuit, with 45 linear feet in bent pipes, as shown, and four 3-in. iron pipe primary coils, capped at ends, and connected with ¾-in. brass nipples.

The outside dimensions of the ice box are 32 in. x 49 in. x 35 in. in height. The box is constructed of wood (⅞-in. x 4-in. T. and G.) and insulated on sides and bottom by means of an inner space of 2 in., packed with mineral wool. The cover is provided with a lift and with brass hinges and the box is pitched for drainage to the 1½-in. pipe which opens over the lead

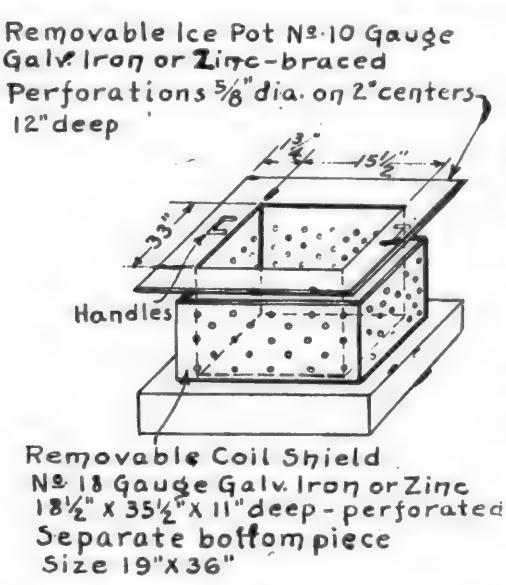



FIG. 2—DETAIL OF REMOVABLE SHIELD.

waste. The box and the bottom of the cover are lined throughout with No. 18 gauge zinc, turned down 3 in. all around outside of the box.

The gravity tank is 16 in. x 20 in. in size, constructed of wood and insulated as described for the ice box. It is provided with a cover and lined with 18-oz. soft rolled copper.

Details are shown of the removable ice pot and coil shield. These have perforations 5/8-in. in diameter on 2-in. centers

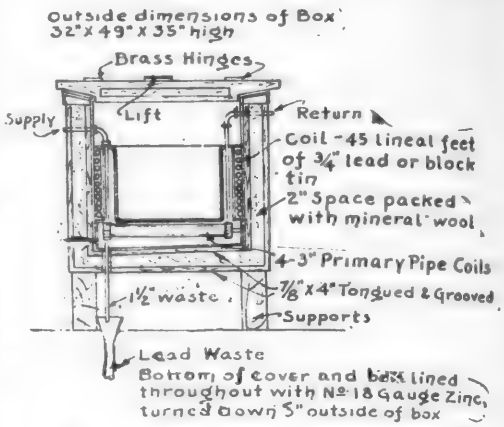

Outside dimensions of Box
32" x 49" x 35" high
Brass Hinges
Supply
Lift
Return
Coil - 45 lineal feet of ¾" lead or block tin
2" Space packed with mineral wool
4-3" Primary Pipe Coils
1½" waste
⅞" x 4" Tongued & Grooved
Supports
Lead Waste
Bottom of cover and box lined throughout with No. 18 Gauge Zinc, turned down 3" outside of box

FIG. 3—DETAIL OF ICE BOX COOLER.

and are of galvanized iron or zinc. No. 10 gauge for the ice pot and No. 18 gauge for the coil shield.

## Trade Extension Committee Launches New Campaign for "Building Bigger Business."

Comprehensive plans for renewing the nation-wide campaign for more business in the heating and plumbing trades, which was sidetracked during the war, have now taken definite shape and the Trade Extension Committee, which has the matter in charge, is out to raise no less than $50,000 to carry out its plans during the coming year. This money will be used mostly by the Trade Extension Bureau which will take up, on an elaborate scale, accounting for the contractor, promotion and education.

Contributions already made towards the work of the Trade Extension Committee include $1,000 each from the Eastern and Central Supply Associations, $500.00 each from the Sanitary Potters' Association, National Boiler and Radiator Manufacturers' Association and Enameled Sanitary Ware Manufacturers' Association; $250.00 from the Range Boiler Manufacturers' Association; and $100.00 from the Carbon Club.

One of the principal objects of the Trade Extension Bureau is to establish national sales campaigns. It will show the contracting fitter and plumber the way to accomplish these sales. To fill this anticipated demand, the bureau is working out a complete programme of operation, including a compact bookkeeping system for the trade which will be furnished through the jobber or association. Condensed pamph-

lets are being prepared explaining each operation in detail so that any school boy can install the system. In fact, the programme has been compiled after a very careful survey of the ailments of the trade and the remedy to be applied is the plan followed by the more progressive contractors, men who have been successful because they have learned the fundamentals of business and advised the best methods of application. Following is the bureau's programme in full.

1919 PROGRAMME OF THE TRADE EXTENSION BUREAU.

*First—Accounting for the Contractor.*

A. By compiling a complete bookkeeping system.

B. By compiling a cost system.

C. By compiling short efficient methods of estimating.

D. The starting and stopping of credit extension by the Contractor.

E. Collections: 1. Proper Contract Forms; 2. Trade Acceptance; 3. Collection Forms.

*Second—Promotion.*

A. How to build personality.

B. How to construct and use a Show Room.

D. How to construct and decorate a Show Room.

E. Salesmanship.

F. Business Location.

G. How to prepare and use circular letters and literature.

H. How to successfully stage a selling campaign.

I. How to construct and use a follow-up system: 1. On Prospects; 2. On estimate submitted.

J. How to secure the co-operation of Journeymen (Selling Service).

K. How to secure the co-operation of Manufacturers, Jobbers and Salesmen.

L. Establishing National Sales Weeks.

M. Advertising.

N. How to secure the cooperation of competitors.

*Third—Education.*

A. The distribution of condensed printed pamphlets covering each of the above topics prepared by the commissioner.

B. Changing public prejudice.

C. Substitution and true costs of so-called cheap materials.

D. Interchange of views between Manufacturers, Jobbers and Contractors.

E. Compiling of an official list of Plumbing and Heating Contractors.

F. Lecturers by the Commissioner at all State and National Meetings of the Trade and Salesman's meetings.

G. Securing enthusiastic co-operation of Local Associations.

H. Promotion crews to make experiments and educational sales drives.

SYSTEMIZING THE WORK.

This work will be prepared and directed by competent men employed by the bureau. The head of the accounting department will work with representatives of the heating and plumbing fraternities, so that this department will have the endorsement and support of the various associations.

The promotion department will be divided into various parts with experienced men at the head of each division. This department will make practical experiments upon the questions allotted them and will supply the manufacturer, jobber and the trade generally with data and plans covering their problems.

As an example, the force in charge of showroom and show-window displays will furnish plans to the trade, free of charge, and suggest layouts for their displays. Manufacturers will be advised as to the best kinds of advertisements adapted to show-window displays. This department will arrange with the manufacturer, jobber and contractors a programme for layouts of window displays for each sales week a series of sales weeks.

The educational department will be in charge of men who have been actively engaged in educational work for some years past and are thoroughly familiar with the needs of the trade and the best methods of meeting them. The trade will be taught how to use advantageously the costly pamphlets, booklets and other advertising matter furnished by the manufacaurers, most of which now finds their way to the waste paper basket.

All departments will be interlocked, all working to the end of improving business and extending sales in the heating and plumbing lines. Later it is proposed to send out field forces from the central office to carry on educational and promotion work.

THE BUREAU A CLEARING HOUSE.

This bureau has been organized as a clearing house for the industry where questions affecting it can be corrected for the best interest of all concerned, very much along the lines followed in other industries.

According to the prospectus subscriptions towards financing the Trade Extension Bureau and its programme may be paid in quarterly installments, on May 15, August 15, November, 15, 1919, and February 15, 1920.

The officers of the Trade Extension Committee elected at a recent meeting, are:

President, L. McNamara, also president of the National Association of Master Plumbers; treasurer, C. V. Kellogg; secretary, Paul Blatchford. Finance committee: James Conran, chairman; C. V. Kellogg, J. F. Evans, William Byrd, Jr., B. O. Tilden, R. B. Flershem, L. O. Koven, A. M. Maddock, Edward F Niedecken, T. E. O'Brien. McNamara is also a member of the finance committee, ex-officio.

The chairman of the publicity committee is William J. Woolley.

# THE RECONSTRUCTION ERA

### Proposed National Conference to Democratize the Construction Industry.

A national conference of representatives of the construction industry is being planned by the National Federation of Construction Industries with a view of enabling all the parties concerned to come to an understanding relative to the new economic conditions prevailing throughout the country. It is believed that such a conference would devise a construction programme applicable to present conditions. The directors of the Federation feel that existing class conditions are un-American; that new standards of carrying on the construction business must be formulated; that the construction industry must be democratized; and that unity of purpose and fairness of action will result if the representatives of the several groups concerned will sincerely seek the solution of present difficulties.

Through such a conference as is proposed it is expected that the farmers, the workmen and the business executives interested in construction, who jointly are the producers and the consumers of the construction, commodities, will, by candid discussion and sincere examination of the views expressed by the others, arrive at the conclusion that the democracy of the construction industry is as essential as that of the government. As Americans, it is claimed, we do everything together except in business and it is the opinion of the directors of the National Federation of Construction Industries that through such a democratization of the construction industry there will be created in this industry a mutual trust, respect and spirit of co-operation between hitherto separated classes.

The present plan for the conference is to hold specialized group meetings, general group meetings and meetings of the whole. Included in the group meetings will be those of construction manufacturers, construction contractors, labor interested in construction and representatives of the financial interests.

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### Contracts Let Show Improvement in Building Industry.

Commencing with the first week in April, complete figures on contracts let in the building and construction industry in the territory east of the Mississippi and north of the Ohio River, showed an unmistakable trend towards the long-expected business boom. The contracts let for the week ending April 4, amounted to no less than $60,864,085.

That this figure presents a remarkable evidence of increasing activity in the construction field is shown by the statement of the Department of Labor's Information and Education Service that if the amount involved in contracts awarded during each week was $60,000,000 as in the week for which complete statistics are given, the total for such a month would be $260,000,000. The nearest approach in the records to this total is in the month of June, 1918, when the amount was $248,000,000, of which a considerable portion was undoubtedly government work.

In a division of the contracts let for the week in question, those for clubs, hotels and institutions were 37 in number, amounting in value to $1,969,430. There were 34 Federal, State and municipal buildings started, with a valuation of $10,206,192. Other items were as follows:

| *Project* | *Number* | *Valuation* |
|---|---|---|
| Garages, stables..... | 173 | $1,303,740 |
| Industrial ..... | 328 | 13,790,162 |
| Public work ..... | 143 | 8,020,275 |
| Residential ..... | 1,644 | 9,293,111 |
| Schools, churches, theatres | 71 | 6,518,693 |
| Stores, offices, banks..... | 227 | 7,483,477 |
| Terminals, R. R. Stns..... | 1 | 1,500,000 |
| Miscellaneous ..... | 23 | 346,000 |

### The Federal Liquidation Association.

Some idea of the extent of the work confronting the Federal Liquidization Association, which has been formed to facilitate the liquidization of reduced, suspended, or cancelled war contracts, formal and informal, may be had when it is stated that thousands of contracts have been suspended by the government in the midst of performance, involving billions of dollars. This money is tied up pending liquidation of these contracts.

The settlement of so vast a number of suddenly-terminated contracts is a new problem, as they present an infinite variety of terms and conditions and were halted in every conceivable stage of execution.

Brigadier-General Hugh S. Johnson, president of the association, is the author of the army supply system, chairman of the War Department Superior Board of Contract Review and director of purchase. He resigned from the army to take charge of the new association, with the approval of Assistant Secretary of War Crowell, director of munitions.

Local offices have been established in New York, Boston, Philadelphia, Baltimore, Rochester, Bridgeport, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago and St. Louis.

### Pre-War Prices and Pre-War Wage Scales Held to be Out of the Question.

Since January the Information and Education Service of the Department of Labor states that it has received thousand of letters from architects, building contractors, prospective investors in buildings, and from State and municipal authorities in which it was represented that uncertainty as to prices and wages, rather than the present high level of prices and wages, were the stubborn obstacles to be eliminated before a general revival of building and construction work would be had.

Recently the Information and Education Service has been putting out the results of investigations of trained economists in the price and wages fields. The conclusion has been that the popular expectation of a re-establishment of pre-war prices is not justified. It was asserted that wages had not advanced in proportion to living costs, and that while minor changes might be expected in some fields, the country on the whole is on a higher price level.

All economists and practical business men, it is pointed out, agree that currency conditions are an important factor in present prices. This, it is held, cannot be admitted without admitting also that present currency conditions are an important factor in present wages. Money is just as cheap when it buys labor as when it buys steel and those who talk of pre-war wage scales under present currency conditions overlook the fact that we do not have pre-war dollars and we will not have them for many years to come.

The Department of Labor holds that wage scales have less to do with construction and maufacturing costs than efficiency of labor. Investigations in this field suggest a gradual improvement in efficiency of labor as the readjustment progresses and industry gets away from the high-speed, forced-production regime incident to war.

### Facts About Canada.

Many facts interesting in themselves and of particular value to manufacturers and exporters are given in a booklet on Canada which the Guaranty Trust Company of New York has just issued. The economic resources of the dominion are set forth in descriptive matter and in tables containing the atest available statistics. The booklet will be mailed upon request.

### To Establish Federal Home Loan Banks.

The next Congress will be asked to enact legislation necessary to the establishment of a system of Federal Home Loan Banks. A tentative bill has been prepared and has been mailed to all officers and committees of the United States League of Building Associations and copies can be obtained from the Division of Public Works and Construction Developments of the U. S. Department of Labor.

In its campaign to stimulate building activities the U. S. Department of Labor, in January, invited representatives of the U. S. League of Building Associations to a conference in Washington. Out of this conference came the movement in favor

of a national system of home loan banks through which these associations might rediscount their securities and make available for further loans a greater portion of their assets.

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### Chamber of Commerce Votes to Recommend Reconsideration of Anti-Trust Legislation.

Reconsideration by Congress of all anti-trust legislation is recommended by the Chamber of Commerce of the United States as the result of a referendum vote of the business interests of the country represented in trade and commercial organizations.

The proposals and the vote follow:

Congress should be asked immediately to consider the present situation of all statutes constituting our anti-trust legislation—for, 1543; against, 51.

In reconsideration of existing anti-trust legislation there should be formulation of standards of general business conduct to be administered by a supervisory body—for, 1159, against, 389.

An enlarged Federal Trade Commission should be made the supervisory body—for, 1102; against, 437.

In view of the importance of the functions of the Trade Commission as they would exist the membership of the Federal Trade Commission should be increased to nine—for, 1104; against, 422.

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### Basis for National Labor Programme.

A statement of principles of industrial relations, prepared with a view to furnishing basis on which American industry can build a national labor program, was submitted today to a referendum vote of the membership of the Chamber of Commerce of the United States. The principles, thirteen in number, were prepared by a special committee of the Chamber after a long period of study of the entire subject of industrial relations. They are given as follows:

1. Industrial enterprise, as a source of livelihood for both employer and employee, should be so conducted that due consideration is given to the situation of all persons dependent upon it.

2. The public interest requires adjustment of industrial relations by peaceful methods.

3. Regularity and continuity of employment should be sought to the fullest extent possible and constitute a responsibility resting alike upon employers, wage earners, and the public.

4. The right of workers to organize is as clearly recognized as that of any other element or part of the community.

5. Industrial harmony and prosperity will be most effectually promoted by adequate representation of the parties in interest. Existing forms of representation should be carefully studied and availed of in so far as they may be found to have merit and are adaptable to the peculiar conditions in the various industries.

6. Whenever agreements are made with respect to industrial relations they should be faithfully observed.

7. Such agreements should contain provision for prompt and final interpretation in the event of controversy regarding meaning or application.

8. Wages should be adjusted with due regard to the purchasing power of the wage and to the right of every man to an opportunity to earn a living at fair wages, to reasonable hours of work and working conditions, to a decent home, and to the enjoyment of proper social conditions.

9. Fixing of a basic day as a device for increasing compensation is a subterfuge that should be condemned.

10. Efficient production in conjunction with adequate wages is essential to successful industry. Arbitrary restriction on output below reasonable standards is harmful to the interests of wage earners, employers, and the public and should not be permitted. Industry, efficiency and initiative, wherever found, should be encouraged and adequately rewarded, while indolence and indifference should be condemned.

11. Consideration of reduction in wages should not be reached until possibility of reduction of costs in all other directions has been exhausted.

12. Administration of employment and management of labor should be recognized as a distinct and important function of management and accorded its proper responsibility in administrative organization.

13. A system of national employment offices, with due provision for co-operation with existing state and municipal systems, can be made, under efficient management and if conducted with due regard to the equal interests of employers and employees in its proper administration, a most helpful agency, but only if all appointments are made strictly subject to the Civil Service law and rules. Policies governing the conduct of a national system of employ-

ment offices should be determined in conjunction with advisory boards,—national, state and local,—equally representative of employers and employees.

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**Federal Government Will Spend $305,369,464 on Public Improvements and Buildings.**

Despite the failure of the last Congress to pass important appropriation measures, the Federal Government is getting under way a vast amount of building and construction work. Congress passed the appropriation for $9,050,000 for new hospitals and improvements to old ones needed by the Public Health Service and this building activity is being rushed and will be under way by the end of the year. Some of these projects will be under construction by midsummer.

The building program of the Public Health Service, to meet the requirements of soldiers and sailors availing of their privileges under the War Risk service, calls for remodeling and additions to hospital properties at Camp Cody, N. Mex.; Camp Hancock, Ga.; Camp Joseph E. Johnson, Fla.; Camp Beauregard, La.; Camp Logan, Tex.; Camp Fremont, Calif.; and the nitrate plant at Perryville, Md. For these necessary changes and additions $750,000 are available. The hospital project in Cook County, Illinois, most of which is completed, carries an appropriation of $3,000,000.

There is an appropriation of $1,500,000 for the building of a sanatorium at Dawson Springs, Ky., the survey is being made and for the site and hospital plant at Norfolk, Virginia, $900,000 has been appropriated. An appropriation of $550,000 was made to take care of the hospital project in the District of Columbia and $190,000 were voted for improvements in the Marine Hospital at Stapleton, Staten Island, N. Y.

The failure of the last Congress to appropriate money to take care of the building program in the Treasury Department has held up about 150 projects, for the most part post-office buildings. Almost every State in the Union is represented in this list of deferred projects which involves the expenditure, on present construction prices, of more than $23,000,000.

Many of these projects were contemplated before the war and money appropriated to cover the construction costs on the then prevailing prices. Estimates at that time showed these buildings would cost approximately sixteen and a half millions. The present estimates are about six millions more and before the work can be undertaken Congress must appropriate enough money to take care of this increase in building costs. There is little doubt but that the next Congress will take care of this.

# CORRESPONDENCE

**Keeping an Outdoor Water Tank from Freezing.**

EDITOR HEATING AND VENTILATING MAGAZINE:

Near our city there has been erected a water tank of wood, 2 in. thick, with a wooden cover. The tank stands out in the open and measures 50 ft. in diameter (round) by 16 ft. high, which being filled to within 1 ft. of the top, gives it a capacity of 220,300 gal., or 1,838,425 lbs. of water.

This tank is to be drawn from in case of fire. What I wish to know is, how much iron pipe heating surface should there be in the tank to keep the water from freezing at 25° F. below zero, and how should it be figured? At present steam from a cast-iron boiler supplying heat to a building at 5 lbs. pressure is available for the tank.

Chicago, Ill. A. G.

The amount of surface, if heat were maintained continuously at the temperature named, would be about 250 sq. ft. of pipe and about 5 H. P. in boiler power. There are 4380 sq. ft. of outside surface at 40° F. inside and —25° outside, or 65° difference and 0.5 B. T. U. as the transmission through the sides.

$4380 \times 33 = 144{,}540$ B. T. U. per hour. This divided by 33,000 B. T. U. gives 4.5 H. P.

The above is more or less of a guess, based on assumption, as the water has enormous storage capacity for heat and there would probably be several days of freezing weather before any solidification took place, except on the top surface and around the sides of the tank.

If the surface was kept from freezing, as well as the outlet and inlet, there would be no trouble. Still water is a non-conductor, ice is always at 32° temperature in contact with water, and as it becomes thicker it forms more and more of an insulation for the water beneath or within. If you supply a moderate amount of heat and look up the weather bureau reports for the longest period of weather below 32°,

you can probably compute the period of time it would take to freeze the tank.

Your best method is to heat the water moderately in mild weather and depend on the storage to carry it over the cold snaps.

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### Substituting Pipe Surface for Radiators.

EDITOR HEATING AND VENTILATING MAGAZINE:

I have an eight-section, three-column radiator that is figured at 64 sq. ft. of radiation. On account of changes I am obliged to substitute 1-in. pipes to be placed against the wall. How many feet of 1-in. pipe will be required to obtain the capacity of the present radiator?

Is it not a fact that if the required number of feet of pipe for the above condition are placed continuously on two or three sides of a room, instead of all on one side, or at one part, as is the case with the present radiator, that less radiating surface would be necessary. In other words, if an equal amount of pipe is substituted for the present radiator, will not a higher temperature be obtained and, if so, how much higher?

Kansas City, Mo.

MECHANIC.

An eight-section, three-column radiator, 38 in. high has 40 sq. ft. of surface and if 45 in. high, it has 48 sq. ft. Three feet of 1-in. pipe is equivalent to 1 sq. ft. of plane surface.

The difference in transmission from 212° F. and 70° for cast-iron and pipe is 250 B. T. U. per hour for the one and 300 B. T. U. for the other, or an increase per square foot of 20% in transmission for the pipe coil. The coil will have better distribution and the surface can therefore be reduced somewhat, say, 8 or 10 sq. ft., if you have already found the operation of the radiator to be satisfactory.

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### Comparative Advantages of High and Low Pressure Steam in Heating Work.

EDITOR HEATING AND VENTILATING MAGAZINE:

Will you kindly state the advantages and disadvantages and loss or gain resulting from the use of a pressure-reducing valve set at 3 lbs. on a boiler used exclusively for heating, carrying 100 lbs. pressure, as compared with the maintenance of a low pressure on the boiler?

Also, will you kindly discuss the effect of superheat on the expansion of steam and the bearing it has on main and radiator sizes, also the rate at which dry and saturated steam gives off heat.

Denver, Colo.

E. C. L.

Theoretically, there is no difference if the work actually performed is the same under both pressures. There are some practical advantages in operating a boiler at high pressure over low in that the water in the boiler would be at a temperature of 338° F., while at 3 lbs. it would be about 222°. This gives a storage capacity to assist when the fire is cleaned and while new coal is being raised to the proper combustion temperature.

The density of the steam is greater, being 0.26 lbs. to the cubic foot at 100 lbs., and 0.045 at 3 lbs., or over six times greater. Therefore, 1 cu. ft. of steam in the boiler at 100 lbs. pressure would furnish 6 cu. ft. at 3 lbs. pressure. If there is sufficient grate and chimney capacity to burn the fuel a boiler with short heating surface can be operated at far greater capacity at 100 lbs. than at 3 lbs. pressure and the higher combustion rate gives a greater intensity or heat than the lower rate at the reduced pressure, without any corresponding loss in economy. If you have not the facilities in grate and chimney for burning the fuel it would be impossible to maintain the higher pressure in any case. On the other hand it is difficult to provide a gravity return for the condensation with the higher pressure and if traps or pumps are used, the advantage of the higher pressure may be lost in the method of returning the condensate.

It is well known that heating systems that could not be operated at 3 lbs. pressure at the boiler have been made successful by installing a reducing valve and raising the pressure on the boiler.

Superheat in steam is a condition maintained by heating the gas at temperatures higher than the one corresponding to its saturated state in contact with the liquid. For each B. T. U. added to a pound of the gas its temperature is raised about 2° and its volume increased in proportion or, the volume remaining constant, the pressure is raised. It has no bearing or advantage in heating because, due to the extreme rise in temperature for the quantity of heat involved, it is soon reduced to the saturated state. It is advantageous in transmitting steam long distances with high pressures and velocities, utilizing the superheat to provide for the radiation of mains of small circumference, so that there will be a minimum loss of radiation and condensation at the end of the line.

It does, however, enter into engine and turbine operation because the same high

pressure can be obtained with fewer pounds of water to the cubic foot, due to the increased volume; also, the less latent heat provided for a cubic foot of steam, the greater the economy, reducing the size and cost of the condenser. If steam is saturated at 175 lbs. gauge pressure, the volume is 2.41 cu. ft. to the pound and the temperature, 377.6 F. If it is superheated 100° its volume is 2.81 cu. ft. to the pound and its temperature 477.6°. We therefore obtain 0.4 cu. ft. of steam at the same pressure for the same expenditure in B. T. U. per pound in latent heat, or 16% more steam. There are other operating advantages and disadvantages due to its use. We would have added 50 B. T. U. per pound for the superheat and reduced the latent heat 160 B. T. U. per pound.

In heating, the rate at which heat is given off is entirely dependent on the thickness and type of the receptacle and the temperature either side of the wall, so there would be little difference, except the higher initial temperature, whether superheated steam or saturated steam were used, as the extraction of the comparatively small amount would reduce superheated steam to saturation and condensation would commence. As a rule, the superheated condition can only be maintained when there is a high steam velocity or where additional heat is continually supplied.

# LEGAL DECISIONS

### Rates—Determination of Radiation.

The Wisconsin Railroad Commission has authorized the Wisconsin-Minnesota Light & Power Company to increase its rates for water heating service at LaCrosse from 18 cents to 19 cents per square foot of radiation. Installation of thermostats was ordered. The question arose whether the operation of the electric utility was incidental to that of the heating, or vice versa. The commission said that so long as the circulating water in the heating system carries only the waste heat from exhaust steam from the electric utility, the operation of the heating utility may rightly be said to be incidental to that of the electric. But heating service can be considered as only partially incidental to that of a jointly-operated electric plant, although exhaust steam from the latter is used as the source of heat furnished to the consumers of the heating plant, where it appears that in severe weather this has to be supplemented by additional boilers. From the standpoint of adequacy of service the two departments must therefore be considered as on a par.

Three factors are involved in determining the heat to be obtained; the amount of radiation installed, the rate of circulation of hot water through it, and the temperature of the water entering the radiators. The company can and does vary two of these factors, and thus can give adequate service, even through an amount of radiation that is somewhat less than it should be. But the amount of radiation installed should be substantially what would be required when certain values are assumed for the other two factors under given conditions as to weather and character of building construction. So long as the amount of radiation used in computing the bills for service is in every case based upon the same rule for determining proper radiation surface, there will be no discrimination, even though that amount is greater in some instances than the radiation actually installed.

A heating company cannot, under a rule that it "does not in any case contract to heat less than the whole of any building or apartment occupied by the consumer" collect from the owner of a business property for the heating of interior hallways or vacant rental space where no heat is actually furnished, and where such heat as is furnished for occupied space is upon contracts with tenants individually. In determining the amount of radiation to which a heating service rate is to be applied, the partitions, floors, and ceilings which separate hallways and vacant apartments in which no radiation is actually installed, may be treated as outside exposures of the heated apartments, but not to the same degree of cold as the outside air.

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### Cost of Repairing Heating Plant.

In an action for damages it appeared that in the fall of 1916 the defendant had the general contract for the erection of a school building, and the plaintiff had the contract for installing therein a heating system. Late in the following January the heating plant, which was practically completed, had been tested and found satisfactory, but had not been formally accepted nor paid for by the district board. It was being used with knowledge and consent of the board, however, for the purpose of heating the building while the defendant finished the work under his con-

tract. The plaintiff brought the action to recover damages, alleging that on account of the carelessness of the defendant's employees in wrongfully taking possession of the heating plant and allowing the water to freeze and burst the pipes, it became necessary for him to purchase and install a new boiler, fittings and supplies, in order to repair the plant and that he incurred expenses amounting to $500, for which he asked judgment. The jury returned a verdict in favor of the plaintiff for $385.60. On appeal the judgment was modified, as it appeared the school board had agreed to pay the plaintiff $200 towards the expense of repairing the injury to the plant. No formal turning over of the heating system by the contractor was held necessary to accomplish a temporary acceptance of it by the board. As there was a question whether the board was responsible for the repairs, its agreement to pay the plaintiff for repairing the damage was not without consideration. Daeschner v. Gibson, Kansas Supreme Court, 175 Pac. 681.

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### Heating and Humidifying Patent.

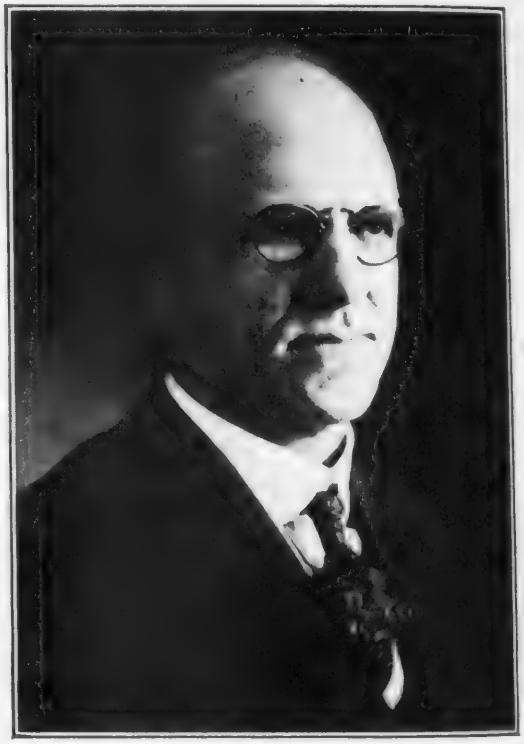
The Circuit Court of Appeals, Second Circuit, holds Buffalo Forge Co. v. City of Buffalo, 255 Fed. 83, that neither anticipation of nor close approximation to, the plaintiff's method of heating and humidifying air, covered by Carrier patent, No. 854,270, claims 1, 3, 5, 6 and 7, is discoverable in the prior art. If the Patent Office had granted claims both for a method of heating and humidifying air and apparatus to conduct the method, that fact would not have vitiated the patent, and conversely, no more does the fact that it refused to do so, to the same patent, at all events. No process patent is in theory either helped or harmed by the excellence or worthlessness of the disclosed apparatus by which it is illustrated. Where an inventor was the first to co-ordinate and disclose a series of operations constituting a method to heat and humidify air, and air moistened by such method was a successful novelty, his patent is held entitled to benevolent construction. The fact that the means, and the only means, of applying the process are strictly mechanical, is of no moment, so far as the patentability of the process is concerned, but if the process, when distinguished from the means of performing it, is new, useful, and intellectually rises to the dignity of invention, it is patentable, if it falls within the meaning of the word "art" as used in the statute.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

### The Director of the Heating Engineers' Research Bureau.

The appointment of Professor John R. Allen, dean of the College of Engineering and Architecture, University of Minnesota, as director of the Research Bureau of the American Society of Heating and Ventilating Engineers, has not only met with instant approval, but has drawn attention afresh to the place Professor Allen has already won for himself in the engineering world.

Professor Allen was born in Milwaukee in 1869 and is a graduate of the University of Michigan, receiving his degree of B.S. (M. E.) in 1892 and his degree of M. E. in 1896. He began his professional career with L. K. Comstock Construction Company, remaining with this firm two years. His career since that time has been devoted, with one notable exception, to the training of students in engineering lines, as instructor, assistant professor, junior professor and finally as professor of me-



PROFESSOR JOHN R. ALLEN.

Director of Research Bureau of Heating Engineers' Society.

chanical engineering in the University of Michigan.

From 1911 to 1913, Professor Allen was engaged in the work of organizing the engineering department of Robert College, Constantinople, Turkey, as dean of the engineering department. The two years spent by Professor Allen in Turkey were full of interesting happenings which Professor Allen was induced to relate at meetings of the heating engineers and elsewhere, giving a remarkable insight to the difficulties encountered in carrying out the building programme, according to American ideas, in this far-off part of the world, as well as to the situation in the eastern part of Europe generally.

On his return to America, Professor Allen became head of the Department of Mechanical Engineering at the University of Michigan, resigning in 1917 to accept the place of dean of the College of Engineering and Architecture of the University of Minnesota.

Professor Allen is a past-president of the American Society of Heating and Ventilating Engineers. He is a member of the mechanical engineers' society, the National District Heating Association and of the British Institution of Heating and Ventilating Engineers.

He has made a specialty of experimental work in heating and ventilation, particularly in connection with heat transmission through building materials. He is the author of "Notes on Heating and Ventilation" and "Heat Engines." He is also the author, with J. H. Walker, of "Heating and Ventilation," which was published last year.

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**New York Chapter Elects New Officers.**

Officers of the New York Chapter for the 1919-1920 were elected as follows at the April meeting of the chapter, held April 24 at the Building Trades Club, New York:

President, Perry West; vice-president, W. L. Fleisher; treasurer, William J. Olvany; secretary, Edwin A. Scott. Board of Managers: P. H. Seward, A. S. Armagnac and G. A. Dornheim.

A number of suggestions were made for the annual meeting and dinner of the chapter May 20, as well as for conducting future meetings of the chapter. The members were urged to get into closer touch with those connected with the trade who are not directly affiliated with the profession and it was even suggested that speakers be secured for the annual dinner from this class of men. Another suggestion was that the vocations of the chapter members be carefully compiled and subjects taken up of particular interest to each group. Mr. Driscoll expressed the opinion that practically every member of the chapter could tell something of interest concerning some experience of his own in the heating field and he suggested that a series of three-minute talks be given by groups of members to be selected.

Following the business session, the main speaker of the evening, R. C. McWane, of the Cast-Iron Pipe Publicity Bureau, was introduced by A. S. Armagnac. Mr. McWane's subject was "Pipe" and he described in an interesting manner, supplemented by blackboard illustrations, the manufacture of various kinds of pipe and the development of the different processes.

He aroused particular interest by explaining his theory as to the cause of more rapid corrosion in steel and wrought-iron pipe than in cast-iron pipe, attributing it to the "flattening" of the crystalline structure of the iron in the process of rolling. This theory, he stated, had been supported in a recent publication of French tests showing micro-photographs of the effect of the rolling process. He instanced as another evidence of the correctness of this view the fact that cast steel will resist corrosion very much longer than wrought-steel or wrought-iron. He concluded by offering to present each of his hearers with a complimentary copy of his book on "Pipe and the Public Welfare," an offer which was eagerly accepted by those present.

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**Annual Meeting of Eastern Pennsylvania Chapter.**

New officers were elected as follows at the annual meeting of the Eastern Pennsylvania Chapter, which was held at the Engineers' Club, Philadelphia:

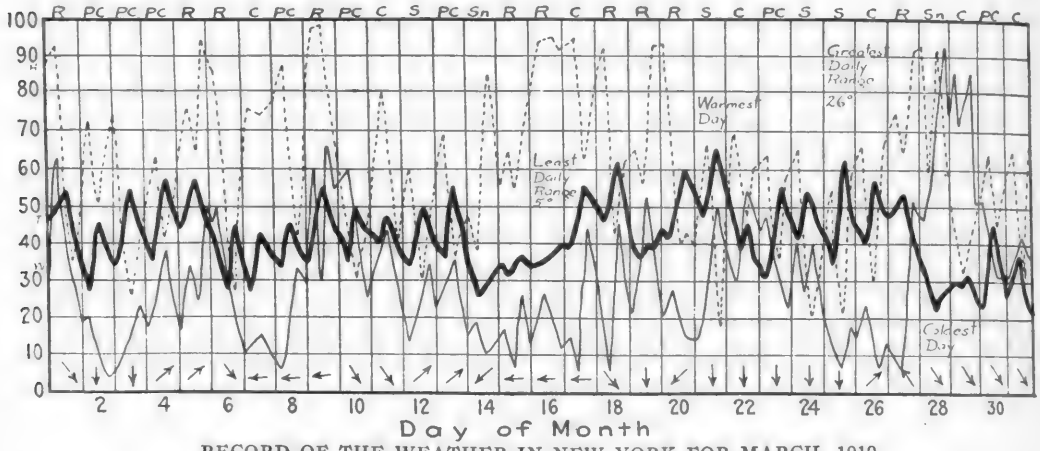
President, Charles V. Haynes; vice-president, Frank C. Hibbs; secretary, Joseph Eschrick; treasurer, A. S. Mappett. Board of Governors: Charles V. Haynes, J. D. Cassell, William G. R. Braemer and E. F. Berry.

A number of committees were appointed including the following: Membership, H. L. Roberts, chairman; meetings, H. B. Gant, chairman; publicity, R. C. Bolsinger, chairman; legislative, M. C. Gillett, chairman; research, A. Thornton Lewis, chairman.

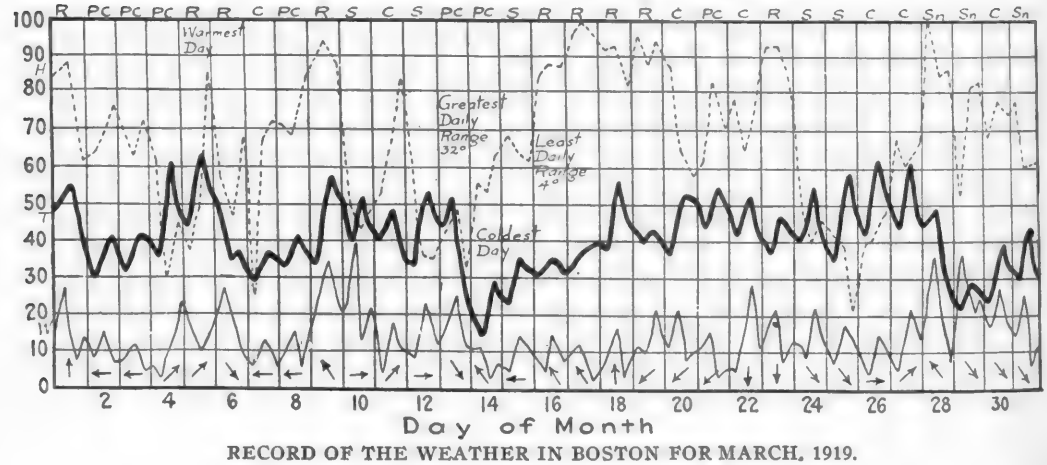
Among the guests of the evening were President Walter S. Timmis of the heating engineers' society, Treasurer Homer Addams and Former President and Chairman of the A. S. H. & V. E. Research Bureau J. Irving Lyle.

# THE WEATHER FOR MARCH, 1919

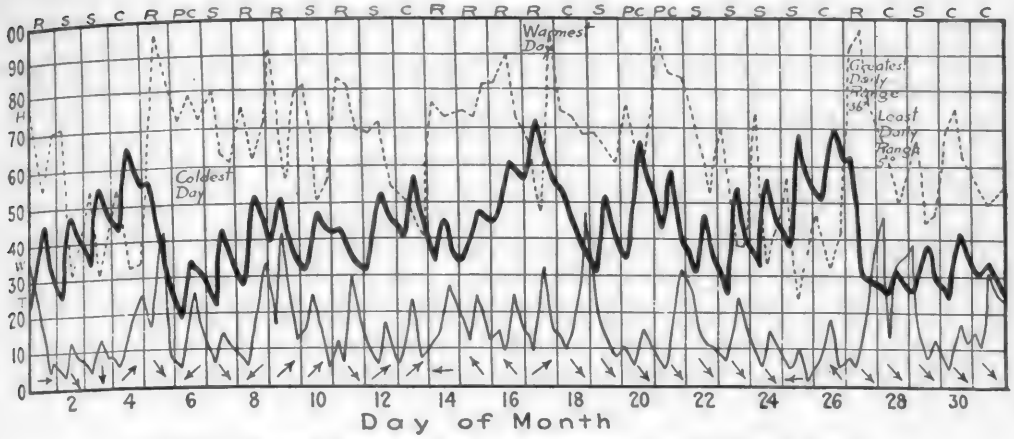
| | New York | Boston | Pittsburgh | Chicago | St Louis |
|---|---|---|---|---|---|
| Highest temperature, degrees F | 65 | 63 | 72 | 68 | 73 |
| Date of highest temperature | 21 | 5 | 17 | 20 | 29 |
| Lowest temperature, degrees F | 22 | 15 | 19 | 8 | 16 |
| Date of lowest temperature | 28 | 14 | 6 | 1 | 1 |
| Greatest daily range, degrees F | 26 | 32 | 36 | 28 | 43 |
| Date of greatest daily range | 25 | 13 | 27 | 20 | 4 |
| Least daily range, degrees F | 5 | 4 | 5 | 4 | 6 |
| Date of least daily range | 16 | 16 | 28 | 31 | 15 |
| Mean temperature for month, degrees F | 42 | 41 | 42 | 38.5 | 47.1 |
| Normal mean temp. for month, degrees F | 37.5 | 35 | 39.5 | 34.4 | 43.5 |
| Total rainfall, inches | 4.69 | 4.11 | 1.89 | 4.32 | 1.72 |
| Total snowfall, inches | 1.9 | 2.4 | 1.5 | 11 | 1.2 |
| Normal precipitation, this month, inches | 4.1 | 4.08 | 3.01 | 2.55 | 3.43 |
| Total wind movement, miles | 17958 | 9168 | 10139 | 10107 | 10341 |
| Average hourly wind velocity | 24.1 | 12.3 | 13.6 | 13.6 | 13.9 |
| Prevailing direction of wind | N. W. | N. W. | N. W. | N. E. | S. |
| Number of clear days | 6 | 5 | 11 | 10 | 14 |
| Number of partly cloudy days | 9 | 9 | 4 | 8 | 10 |
| Number of cloudy days | 16 | 17 | 16 | 13 | 7 |
| Number of days on which rain fell | 17 | 12 | 10 | 20 | 9 |
| Number of days on which snow fell | 2 | 3 | 2 | 4 | 1 |
| Snow on ground at end of month, inches | None | None | None | None | None |



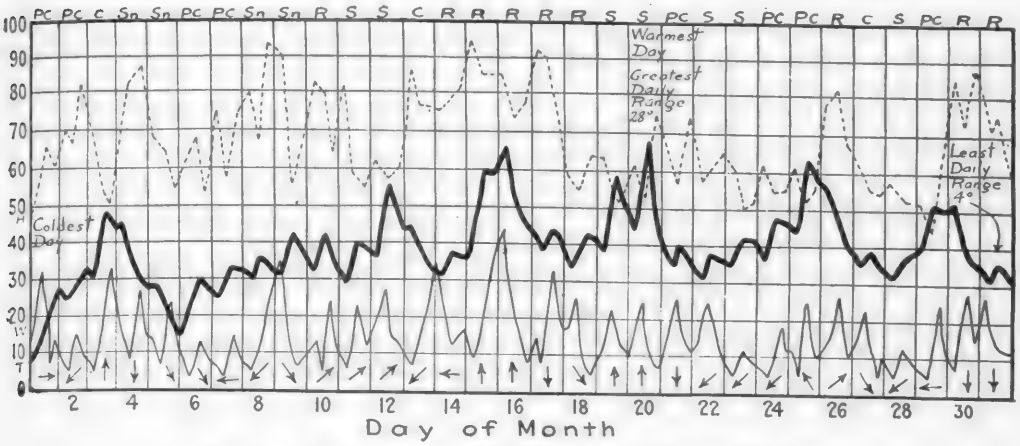

RECORD OF THE WEATHER IN NEW YORK FOR MARCH, 1919.
(Relative Humidity Curve Plotted from Hourly Readings).



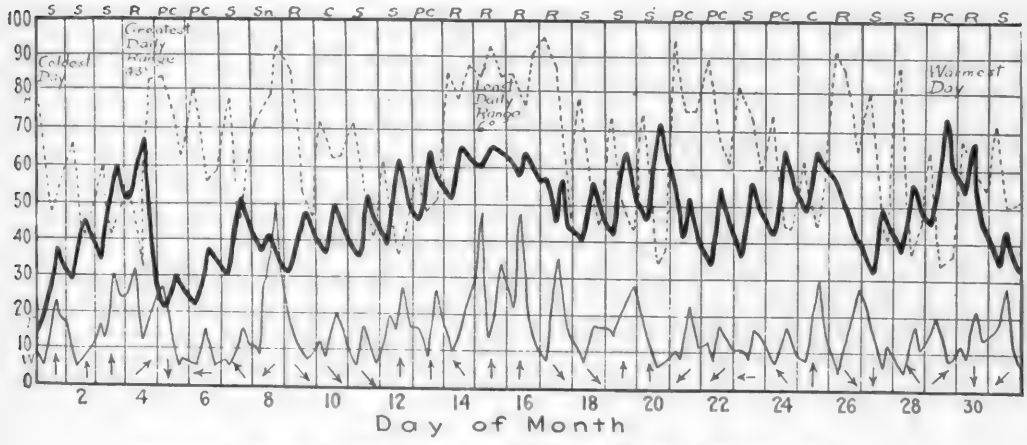

RECORD OF THE WEATHER IN BOSTON FOR MARCH, 1919.




RECORD OF THE WEATHER IN PITTSBURGH FOR MARCH, 1919.




RECORD OF THE WEATHER IN CHICAGO FOR MARCH, 1919.




RECORD OF THE WEATHER IN ST. LOUIS FOR MARCH, 1919.

**Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.**

**Heavy lines indicate temperature in degrees F.**

**Light lines indicate wind in miles per hour.**

**Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.**

**S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.**

**Arrows fly with prevailing direction of wind.**

# MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: *For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

In connection with the foregoing "Editor's Note," it has been suggested that the different types of vapor systems may be more readily understood by classifying them as (1) all systems that utilize thermostatic return-line valves or air-line valves (Paul type) at the return connection of each radiator, and (2) all systems that have, at the return end of each unit or radiator, check valves, elbows of standard or special construction, or any type of valve having a fixed restricted open orifice. While the devices used in connection with the circulation and control of steam at atmospheric or relatively low pressure are legion, yet it is believed that all of these devices constituting the different systems may be divided into the two classes mentioned. Radiator supply valves conform to similar principles of construction in either or both types.

In thermostatic valve systems, steam is not in any appreciable degree present in the return lines. This piping is utilized solely for the purpose of returning the condensate to the boiler, and for the elimination of air, usually through some special apparatus at a centralized point.

In the open return, or check valve, etc., systems, steam is present partially or totally in the return line systems of piping. The condensation and air are handled in the same manner as in a thermostatic system, except that sometimes some sort of thermostatic provision is made to prevent the escape of steam together with the air.

Comparing the relative merits of the two types of systems, the thermostatic valve system assures a positive circulation, as steam cannot short-circuit through radiators near the boiler into the return line, with the possible effect of causing more distant radiators to become air bound. Its pressure range is often less limited, permitting smaller radiators to be used. Usually the pressure range is controlled by the hydrostatic head between the boiler water-line and the terminal of the return line; beyond this point the returns become flooded. However, there are some systems that automatically return the condensation against boiler pressure up to about 10 lbs. gauge. Obviously, the pressure range is increased and made independent of hydrostatic conditions with the thermostatic valve system, so that it is peculiarly adapted to relatively large installations or where there are long runs. The chief objection is relatively greater cost, and unless good judgment is shown in the selection of a thermostatic valve system, trouble may be experienced. Failure of the thermostatic valves to function properly will upset the operation of the entire system.

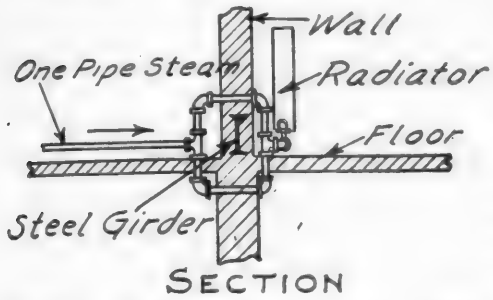
The open return systems are immune from any trouble as to proper functioning. Pressure is usually carefully controlled within the range of a few ounces variable. Also, as the pressure differential between the boiler and the return main is less, flooding of the return main is ordinarily impossible. In relatively small installations, especially when the commercial pipe sizes correspond closely to the theoretical requirements, such systems will often prove highly satisfactory. As a rule, the cost is relatively less.

It is hoped from the foregoing the reader may more readily determine which of the two types is more suitable in a given case.

# WRINKLES

### When Construction Interferes with Gravity Return from One-Pipe Steam Heating System.

The accompanying illustration shows how a one-pipe steam connection may be made to a radiator when the construction interferes with the gravity return of the condensation. This is accomplished by




GETTING AROUND OBSTRUCTION WITH RADIATOR CONNECTION.

dividing the supply before the interference into two branches, one extended below, the other above. The branches are connected again on the opposite side to one pipe to the radiator, or extended from this point to serve any number of radiators.

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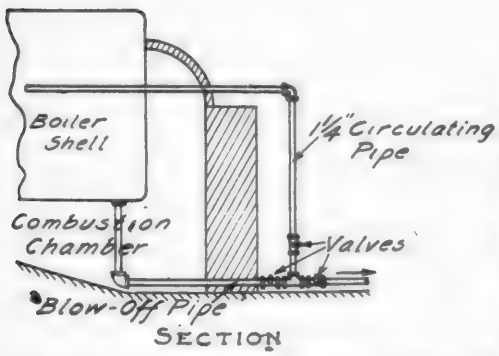
### Protecting the Blow-Off Pipe When Exposed Inside of Boiler Setting.

The blow-off pipe of a brick-set return-tubular boiler may be protected from overheating and burning out, in addition to the usual brick enclosure or other protection,




METHOD OF PROTECTING BLOW-OFF FROM BOILER FROM OVERHEATING

by a 1¼-in. circulating pipe connected in front of the blow-off valve and extending back to the boiler shell. Water in the blow-off pipe, being heated by the gases, will rise in the circulating pipe and in this way be cooled. The circulating pipe also will prevent the formation of scale and may be used, in addition, as a surface blow-off.

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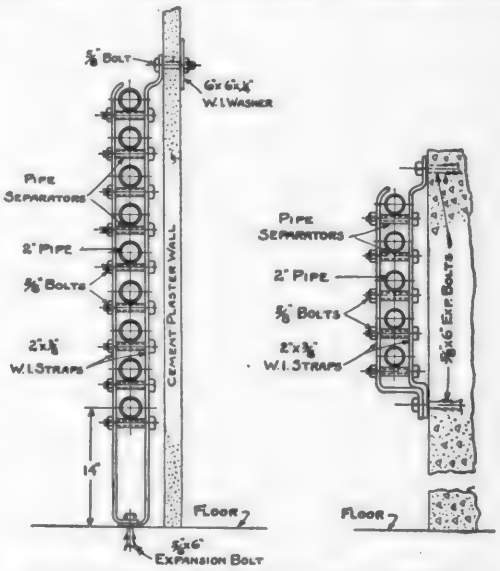
### Supports for Pipe Coils.

Pipe coils of considerable length and when made up of the smaller sizes of pipe are apt to sag and form pockets which, by retaining condensation and air, prevent a free circulation of steam throughout the coil. During the hours of no heating such water pockets may freeze and cause bursting of the pipe. Workmen in discharge of




SUGGESTIONS FOR PIPE COIL SUPPORTS

their duties are likely to mount the nearest pipe coil as a convenient ladder.

For these reasons coils should be made up of 2-in. pipe, while supports should be rigid and permanent and of sufficient strength to support the weight of a man. Supports should be constructed of 2-in. × ⅜-in. wrought-iron straps, held together by ⅝-in. bolts through pipe separators, as shown in the illustration. Depending upon

the number of pipes in a coil, the straps should be secured at the top through the wall by ⅝-in. bolts, with washers, and at the floor by ⅝-in. × 6-in. expansion bolts or by expansion bolts to the floor only.

---

### Operation of Boiler-Feed and Other Pumps.

Considering some of the faults and remedies in the operation of boiler feed pumps, we may start with the suction pipe which should of course be of proper size and of the shortest length possible with sizes increased where the lengths are of considerable distance. The pump suction causes a head due to vacuum which may be offset by excessive friction of long runs.

To obtain a bore of same area throughout use valves of gate type and avoid unnecessary use of tees and ells. The line should be laid at uniform grade to avoid air pockets and should have a fall of not less than 6 in. to the 100 ft. towards the supply end.

When the suction pipe has been installed it should be tested at from 35 to 50 lbs. hydraulic pressure, for even a minor leak will furnish a sufficient quantity of air to stop the pump's action. This suction line, therefore, should be thoroughly inspected for tight connections.

A foot valve is an asset if located for drainage in cold weather. It maintains the line free of air and full of water so that the pump may be quickly started. For the same purpose, it is desirable to connect priming pipes to the pump discharge; these are a necessity in connection with the use of fire pumps. After the pump is stopped, steam and water end cocks and drains should be thoroughly drained to avoid freezing.

A strainer is essential to the maintenance of clear water passages and valves in the pump, the area of its openings being four times the area of the suction line. Duplex or twin strainers are the more desirable though of considerable additional expense. The use of these insure steady operation since the water may be by-passed through one part while the other part is being inspected, otherwise there is a tendency to neglect the strainer, allowing foreign matter to accumulate, with consequent detriment to the proper operation of the pump.

Pumping hot water has its difficulties, increasing with the temperature, where the lift is by suction. Water which will vaporize at atmospheric pressure should flow by gravity to the pump.

Newly-erected steam and exhaust pipes should be thoroughly blown out to avoid metal chips from threading since these will score the valves and seats of the steam chest. Expansion should be provided for and live steam pipes connected with bleeders above the throttle valve so that condensation will not pass through the pump.

Install a large vacuum chamber on the pump or suction line; this is often a necessity with long pipes and high lifts.

Pipes should be supported so as to avoid strains on pump flanges. Check valves are necessary where steam and water pipes are connected as drips into the same pipe. The check should close toward the water cylinder to keep it free from steam. A relief valve should be installed in the discharge line to the boilers, otherwise if the pipe is in any way throttled, excessive pressure will quickly accumulate. This valve will relieve the pressure, when in excess, through a by-pass to the suction or direct connection to the waste pipe.

In important installations a pressure regulator is advisable. This will automatically start the pump when the pressure in the water main falls below a predetermined point, and stop the pump when the pressure exceeds the working pressure desired. A speed regulator may be used to prevent an excess speed or racing of the pump when a sudden demand is placed thereon.

Sometimes the pistons of duplex pumps do not make full stroke in starting. This is usually caused by too tight packing of the stuffing boxes. To prevent leakage where boxes are properly packed it is only necessary to draw lightly on the glands, thereby saving friction Steam valves are given the proper position by the manufacturer before shipment, so that when difficulties ensue in the operation of the pump, it is in order to investigate the water end first before disturbing the adjustment of these valves.

A pump may operate stiffly with uneven strokes from the swelling of fibrous packing in the water plungers, particularly if the liquids pumped are hot. The swelling is usually lateral so that a layer may be stripped from one side to think the packing down. New packing is soaked over night in warm water and should be loosely packed in the space provided so that when wet it will swell and fit as required.

A pump should be started without pressure, running until the air is expelled through a connection to the waste pipe, otherwise with heavy pressure at starting it may fail to operate. With full pressure resting on the discharge valves and the air in the pump cylinder being compressed, water will be prevented from entering.

# NEW DEVICES

## New Automatic Temperature Regulator for Individual Radiator Control.

A unique type of temperature regulator, designed to automatically control steam and hot water rediator valves by a vapor pressure generated within the thermostat itself, has been brought out by T. N. Thomson, consulting engineer, 1033 Ridge Row, Scranton, Pa. It is covered by U. S. patent No. 1,289,963.

The thermostat is of the vapor type and is intended to be attached to the wall of the room whose temperature is to be regulated. A small tube runs from the thermostat to the radiator valve.

The radiator valve is constructed to be

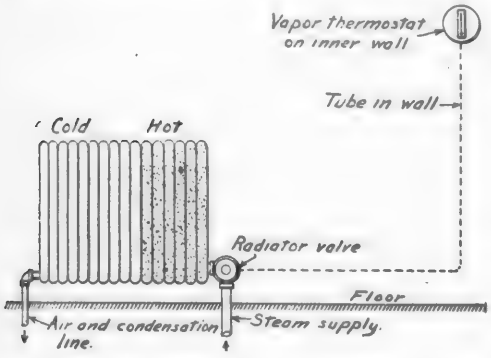



FIG. 1—OPERATION OF AUTOMATIC HEAT REGULATION BY INDIVIDUAL CONTROL OF VAPOR SYSTEM RADIATORS.

balanced and sensitive in action, opening when the room cools and closing when it becomes warmed. It is of the graduating type, opening or closing so as to heat more or less the steam radiation, as the room may require.

In hot water work it operates to throttle the hot water circulation to the radiator as required.

Fig. 1 shows the apparatus connected complete to a steam radiator on a vapor system, to which it is said to be especially adapted. A horizontal section is shown in Fig. 2. The heat-controlling element in this particular makeup is a balanced valve, A, of the poppet type. The ends of this valve are connected to flexible brass diaphragms, B and C, preferably of the same diameter. The valve is, therefore, finely balanced with respect to pressure in the steam mains and in radiator. The thermo-

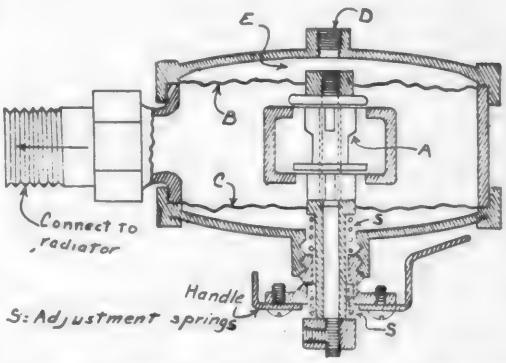



FIG. 2—HORIZONTAL SECTION THROUGH RADIATOR VALVE.

stat tube connects to D, so that thermostat pressure is exerted in chamber E. When this pressure is increased, due to the room being warmed, the thermostat vapor pressure pushes against the diaphragm, B, and throttles down the valve A. This allows less steam to get into the radiator. If the room cools below the desired temperature, the vapor pressure in E becomes lower, then the steam valve A is pulled open a little. This allows more steam to flow into the radiator.

The handle is arranged so that the valve can be set to the required degree with a pointer, indicating the temperature to which the valve will heat the room.

A side view of the type suitable for vapor heating and for two-pipe low-pressure steam work, is shown in Fig. 3. One complete turn of the handle opens the valve full or closes it tight.

For steam radiators whose pressures will run higher than 2 lbs., and for hot water radiation, the diaphragms of the radiator valves are of the "Sylphon" or flexible bellows type. The patent embraces both types.

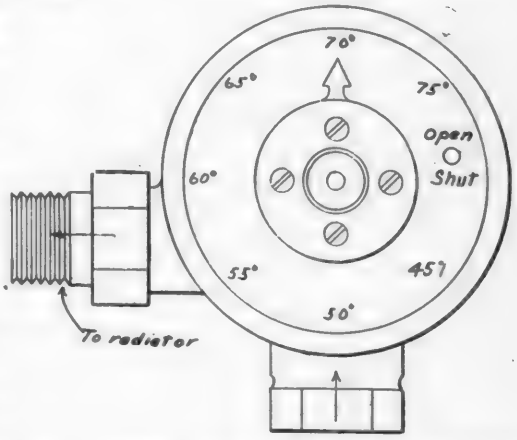



FIG. 3—SIDE ELEVATION OF RADIATOR VALVE.

One of the nine claims granted for this device is as follows:

"The combination of a balanced valve having its controlling element in operative connection with a pair of opposed flexible diaphragms, both subject to the same internal valve pressure on their inner faces, a thermostat exterior to the valve and containing a fluid of low volatility, and means for transmitting the force produced by the vapor pressure of said fluid to one of said diaphragms to move the same and thereby operate the valve."

The inventor, who is well known in heating engineering circles, is planning to dispose of his rights to any manufacturer who may be interested. Mr. Thomson states the he has the device installed in his own home in Scranton where it has been found to operate satisfactorily.

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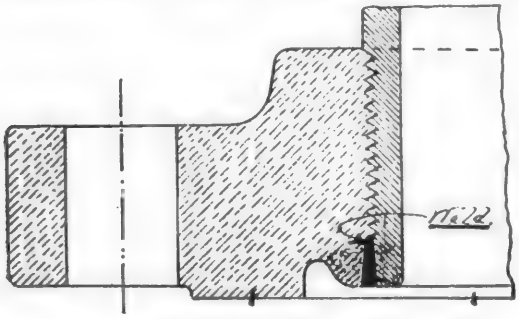
### The R. L. K. Pipe Flange.

The accompanying illustration shows a new high-pressure pipe flange recently patented by R. L. Kjerner, of New York, The joint is also made with a straight face, if desired, but the type illustrated gives a better hold on the gasket and lends itself better for field welding. The flange



DESIGN OF R. L. K. PIPE FLANGE.

can be produced without special tools and equipment.

The thread engaging the pipe nad flange can be either straight or standard pipe taper and is not depended upon for tightness, but is a safeguard against the possibility of a defective weld, it being evident that the pipe and flange cannot part without the threads being stripped. The tightness and strength of the joints rest entirely with the weld which is a little deeper than the full thickness of the pipe, and consequently equally as strong as the pipe.

The strength of the R. L. K. joint was demonstrated in a series of tests made at the testing laboratories of Columbia University by W. J. Keefeld, C. E. Tests were made on a piece of 4-in. standard steel pipe 30½ in. face to face, provided with R. K. L. flange on one end and a Van Stone flange on the other, both made of extra-heavy rolled steel, and blanked off with steel flanges, faced and drilled to the 250-lb. standard. A ¼-in. testing nozzle was attached to the center of the pipe for applying pressure. Both joints were bolted up with the same size wrenches under the supervision of Mr. Keefeld in order to insure an equal tension on the gaskets in both joints. With 1/16-in. thick red rubber gaskets packed in both joints, the Van Stone type joints began to leak at 2100 lbs. and at 2400 lbs. the gasket blew out, but the R. L. K. flange showed no signs of leaks. Packed with 1/16-in. thick asbestos fibre gaskets, the gaskets in the Van Stone flange blew out at 3100 lbs. pressure, while the R. L. K. flange held tight.

The R. L. K. flange, it is stated, has been made in the field and installed in a number of large high-pressure steam and hydraulic piping systems. The cost to the steam fitter of making this joint himself is low, as the average steam fitter generally has the necessary equipment to make it, as it requires only a pipe-cutting machine, welding equipment, either acetylene or electric, and possibly a small gas engine to drive the pipe machine, if the job is located beyond the reach of electric power.

The entire patent is for sale, or rights will be sold to use it in various sections of the country at a flat annual fee.

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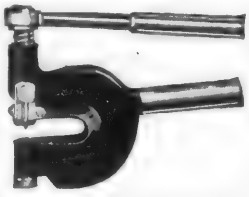
### New Type of Speed Punch.

The Jiffy punch, for tool kit or shop, described as powerful, compact, portable and speedy, is a new product of Paul W. Koch & Co., Chicago, Ill. It weighs 5 lbs. and is 9½ in. long. It works in a small space and punches, 5-32-in., 3-16-in., 7-32.,



JIFFY PUNCH FOR PUNCHING HOLES IN METAL.

and ¼-in. holes in metal up to 10-gauge. Special attention is called by the manufacturers to the deep throat and one-piece automatic, disappearing stripper, giving a clear view to punch and punch mark for next operation. Several sheets may be

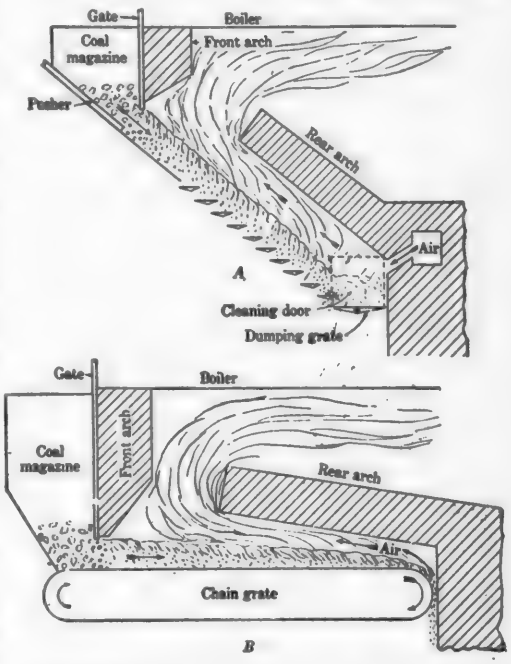
punched with one operation. The punch, it is added, will not twist or turn in operation, practically eliminating punch breakage. It is also found to leave no burr on the metal.

### New Publications.

MALLEABLE IRON, published by the American Malleable Castings Association and issued gratuitously is the title of a booklet which is described as the forerunner of a comprehensive volume to be issued later by the association. The present booklet, however, is full of valuable data on this subject. Although phenomenal progress has been made in this particular industry during the last few years, little or no progress, it is stated, has been made in keeping the public informed regarding these activities. In fact, there is but one book on the market treating on malleable iron. The booklet is divided into three parts, Part 1 dealing with "What is Malleable Iron?" Part 2 is devoted to the American Malleable Castings Association, while Part 3 takes up the uses of the malleable iron casting, the question of whether heavy sections of malleable iron can be completely annealed, the skin of malleable iron casting, and its rust-resisting qualities. A copy of this book may be obtained from the Association, headquarters of the association, in Cleveland, O.

REPORT OF THE UNITED STATES HOUSING CORPORATION, issued by the Bureau of Industrial Housing and Transportation, U. S. Department of Labor, is a government publication of unusual interest, giving details of the vast housing projects undertaken by the government in connection with war work, the immense difficulties met and the manner in which they were overcome. In closing his part of the report, President Otto M. Eidlitz, of the United States Housing Corporation, expresses the hope that the work performed by the corporation will not be lost with the close of the war, but that some means will be found to make use of the vast fund of experience and of material which that emergency has made available. Size 6 x 9 in. Pp. 126.

COMBUSTION EXPERIMENTS WITH NORTH DAKOTA LIGNITE, by Henry Kreisinger, C. E. Augustine and W. C. Harpster, are described in Technical Paper 207, published by the Bureau of Mines. This paper gives the results of combustion tests with two forms of lignite, natural lignite as it comes from the mine and the carbonized residue from gas retorts. The tests were made by burning the fuels at various rates in experimental furnaces and by studying the processes of combustion. The information thus obtained was used in determining some of the general principles on which a successful furnace can be developed for use under power-plant boilers and for house-heating apparatus. A small furnace of this character was designed and tested with promising results at the fuel-efficiency laboratory of the Bureau of Mines, in Pittsburg. Diagram A, in the accompanying illustration, shows a suggested design




SUGGESTED DESIGN FOR BOILER FURNACE FOR BURNING LIGNITE AND ITS CARBONIZED RESIDUE.

for an inclined step-grate boiler furnace for burning lignite, while Diagram B shows the application with a chain grate suggested by the Bureau of Mines. It is stated that the two types of furnaces suggested can probably be used for burning low-grade fuels, other than lignite, which are difficult to ignite. Sixe 6 x 9 in. Pp. 44.

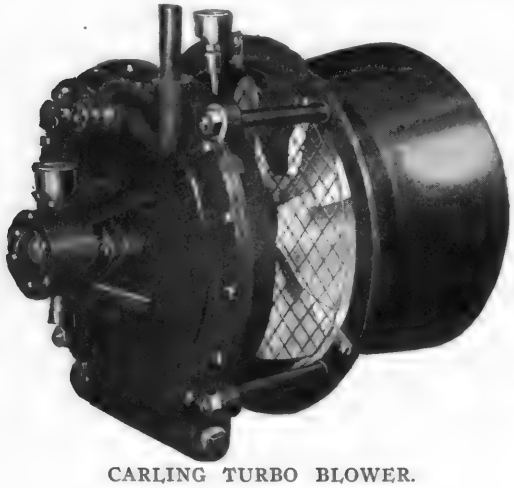
COLLEGE OF ENGINEERING AND ENGINEERING EXPERIMENT STATION of the University of Illinois is the subject of two notable publications issued by the university, one being a pictorial description of the college and experiment station, and the other being a discussion of the development and needs. Among other things the College of Engineering, it is stated, is in urgent need of an additional building to provide ade-

quate facilities for the Department of Theoretical and Applied Mechanics, etc., and for a building to house the various shop laboratories. In the pictorial description interesting views are shown of the furnace testing plant, heating and ventilating equipment in the power laboratory and the ventilation laboratory.

## Trade Literature.

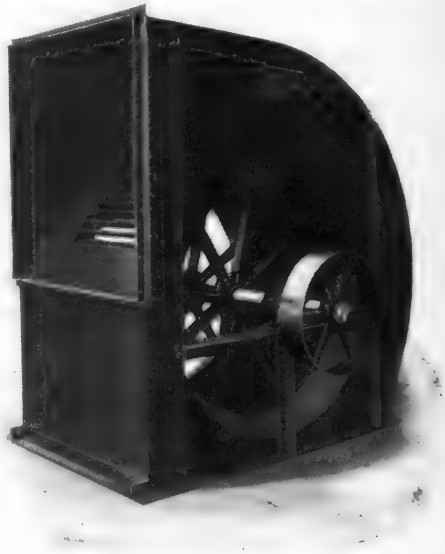
MORE HEAT, LESS COAL is the title of a unique circular issued by the Molby Boiler Co., New York, devoted to the Molby magazine-feed boiler. On opening the circular a view is shown of the Molby boiler and on lifting the panels, which are in two parts, there is disclosed the interior of the boiler with the various features clearly indicated. These include the magazine-feed feature, which permits the carrying of a fuel supply for from 12 to 24 hours; the ability of the boiler to burn hard or soft coal, the down-draft construction, the non-gasing feature, the constant air pressure through the fire bed, as the ashes do not stop the draft; the coal-saving feature and the disposal of the ashes. Other illustrations show the 26-in. one-magazine type and the 31 and 47-in. two-magazine types.

CARLING TURBO BLOWERS, designed especially for burning cheap fuels economically are featured in circular matter issued by the Carling Turbin Blower Co., Worcester, Mass. It is stated that this blower will make possible the burning of low-grade coals which cannot be burned with the ordinary chimney draft. The blower is a steam turbine direct connected to a propeller fan through one common shaft and built as a unit. It can be installed in the side boiler wall or from the rear of boiler or through front boiler wall by making a hole in the ashpit large enough to insert the blower casing. The blower may be installed to operate automatically by means of a balanced valve placed in the steam line to the blower and connecting with a chain to the damper regulator. It is also furnished with other means for automatic control.



CARLING TURBO BLOWER.

BUCKEYE FANS, including various types of the multiblade fan and of the Buckeye disc mine fan, are the subject of new circular matter issued by the Buckeye Blower Co., Columbus, O. It is stated for the Buckeye multiblade fans that the wheels are perfectly balanced before shipment and are correctly designed to give maximum capacity with minimum power. They are also built to withstand severe service, requiring no attention except occasional oiling of bearings. Care has also been taken to enable them to run smoothly and quietly at high speeds, delivering a maximum volume of air for the power consumed. They are



BUCKEYE MULTIBLADE FAN.

described as the strongest and most efficient fans on the market. Buckeye disc mine fans are given special prominence, emphasis being laid on the hub for the 42-in. type, which is a single piece of casting, accurately bored for the shaft, and machined for receiving the blades, which are hot-riveted to two parallel flanges provided around the hub. A large cast-iron disc is used as a companion member to the hub, to which the various blade braces are hot-riveted. The hub and disc are each secured to the shaft by a common key, but

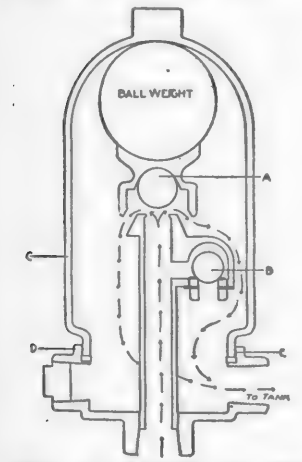
HUB OF BUCKEYE DISC MINE FAN

with separate set screws. They are furnished for direct-connection, belt drive or chain drive. The company also makes another type (36-in.) which is supported in the casing by extra wrought-iron tubes cast in a central yoke, which houses the bearings. This type is ready for installation in partition wall, or is usually furnished with cast-iron base, making it independent of the wall for support.

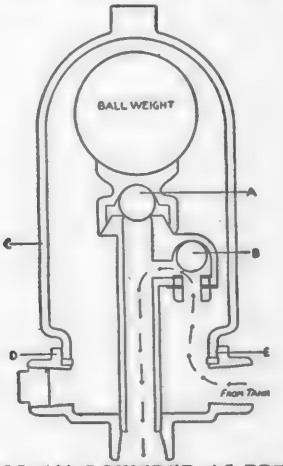
UNIFORM HOT WATER HEATING, featuring the Ball seal generator for sealing hot water systems to increase the radiation, is the title of a well-ocmpiled catalogue issued by the Ball Seal Generator Co., Easton, Pa. There are but two moving parts in this generator, the ball operating the main valve and the ball operating the return valve. Care has been taken in the location of the seats of both valves so that sediment will not collect on them. This is accomplished through the constant rotary movement and change of position of the balls. The metal, being non-corrosive, permits the generator to be in constant use without the necessity of grinding or scraping the valve seats. Another feature mentioned for this generator is that all parts are readily accessible and easily removed, if necessary. Size 3½ × 6¼ in. Pp. 12.

STEAM MOTOR, described as a radical but logical departure from standard practice in the construction of a steam turbine, is described in a newly issued catalogue received from the Steam Motors Co., Springfield, Mass. This machine differs from other types of steam turbines in that it is not a complete machine in itself. It is manufactured with one bearing only and when connected to the driven apparatus becomes an integral part of the complete set, making a unit of the two-bearing overall type. The various advantageous points of the design and particulars of the different applications, are given in detail in the catalogue, which is listed as Bulletin No. 5. The bulletin is well illustrated, the subject matter being presented along approved engineering lines. One illustration shows the motor attached to a forced-draft blower set, indicating the small space occupied by the steam motor equipment.

TRANE PUMPS, designed for all pumping requirements including automatic electrically-driven condensation pumps, hot water circulating pumps, house pumps, mine pumps,



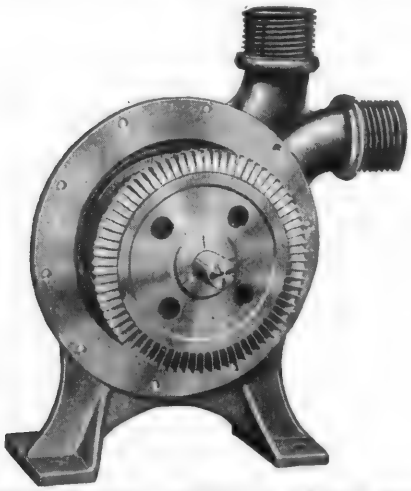

BALL (A) RAISED BY PRESSURE, ALLOWING WATER TO PASS TO EXPANSION TANK.




BALL (A) LOWERED AS PRESSURE RECEDES, SEALING SYSTEM.

BALL SEAL GENERATOR FOR SEALING WATER HEATING SYSTEMS.

trench pumps, etc., are discussed in four bulletins issued by the manufacturers, the Trane Co., La Crosse, Wis. Bulletin No. 1 is devoted to the principle of the Trane condensation pump which has only one moving part which is the impeller revolving inside the casing. This pump is regularly



IMPELLOR AND CASING OF TRANE MASTER PUMP.

furnishing with receiving tank, all mounted on a single base, the sizes being listed as running from 2,000 to 30,000 sq. ft. of radiation against boiler pressures up to 60 lbs. Bulletin No. 2 takes up the Trane condensation pump in particular, electric driven and with automatic control, including capacities and list prices. Bulletin No. 3 covers circulation pumps, high-pressure pumps, house pumps, mine pumps and booster pumps, while Bulletin No. 4 is devoted to Trane trench and irrigation pumps.

## Ventilating System of the Hotel Pennsylvania.

The system of ventilation of the new Hotel Pennsylvania, New York City (the largest hotel in the world), is very complete. Practically all of the service rooms in the three basements and the resturants, concourse rooms, etc., are supplied with fresh filtered, washed, and tempered air by blowers and freed from foul air by exhausters, while all of the 2200 bath-rooms are ventilated by means of exhaust. Some idea of the magnitude of this system can be gained from the fact that over 800 tons of sheet metal were needed to form the air ducts.

There are 27 ventilating fans in all. The blowers are located in three rooms in the sub-basement mezzanine and one on the second floor, while most of the exhausters are on the roof, though there are also a few in the lower fan rooms. All of the fans are design No. 3 multivane fans of Sturtevant make.

The fans are driven by Westinghouse slow-speed direct-current motors, with the fans mounted directly on the motor shaft. A speed range of from 1 to 1½ or 1 to 2 is obtained by means of manually operated controllers, field control being used in all cases. These motors were specially selected for their quiet operation.

## How One Large Company is Helping to Boost Business.

A noteworthy effort has been made by the American Radiator Company, Chicago, to promote the resumption of building through two form-letters which the company has sent out to all architects and to a list of

**Your patriotic Duty in Buying NOW!**

Reconstruction asks heroisms of ALL of us, just as in the War. Man cannot live to himself alone—each is dependent upon his fellow. Work is needed—asked for. Good wages must be maintained—to meet living costs—to tide over. Money should be spent wisely of course. But it is not wisdom and it is not patriotism to keep from buying needed things. Practical citizenship realizes that all good which came during the War by improving the earning capacity and therefore the living conditions of several million families must not be allowed to backslide to the old conditions, or worse. We must all help to keep them up!

*The Plus-patriotism of Peace*

*To keep wages and morale up*

***Why you should start at once to build or remodel***

It is better to lose a little—it is better to pay some difference—because it is best for your community, and best for the country as a whole. When you buy, you help someone who helps someone else, and he in turn helps you.

Building material has declined—what higher figures still exist are due almost wholly to labor cost, which in turn is due to higher food prices which bid fair to remain high for several years.

If you need a home or a building—if you have funds available—start the improvement at once. You can't make a mistake to buy—in the long run—and you can make the mistake of not having now *what you need.*

**We announce 25% price reduction**

Promptly on January 1 we decided to sacrifice present profits and announced 25 p. cent price reduction on IDEAL Boilers, AMERICAN Radiators, and ARCO WAND Vacuum Cleaners to quicken building and remodeling, and in answer to the public demand to give employment to demobilized men.

Building material on ground has been reduced and is sold at a smaller margin of profit than before the War. Ask the bids and watch us.

**New material and methods have cheapened building!**

Architects and Engineers tell us that wartime economies have taught how to substitute lower priced materials, how to save by using standard sizes, by employing simpler methods, by buying materials produced near home. They can save builders of today much money. Consult them! In similar ways you can cut the price of an IDEAL Boiler and AMERICAN Radiators by omitting the useless extra chimney or two, by omitting useless fireplaces and mantels, needless doors and double windows—expenses which all go with old time stove and hot air furnace heating. Also you can save by omitting the fancy things never lighted, books never read, vases that contain no flowers, piano never played, etc.

**Home building is the best and safest investment today**

Building a home is always the wisest investment a family can make. It brings many returns not to be calculated on a mere interest cost basis. You can make no better paying investment than by *changing your house into a home* by the cool-saving outfit of IDEAL-AMERICAN heating. Make the dollars work—for you and others. ACT NOW

**AMERICAN RADIATOR COMPANY**

"BUSINESS BOOSTING" ADVERTISEMENT OF AMERICAN RADIATOR COMPANY

over 500 newspapers. The letter to architects is accompanied with an advertisement on "Your Patriotic Duty in Buying Now." The letter to the newspapers urges them to secure a similar line of publicity from their local building-material manufacturers and dealers, either individually or as building trades associations.

### Pay of Technical Engineers and Draftsmen in St. Louis

An interesting table has been compiled for the use of the Wage Commission of the St. Louis Chapter, American Association of Engineers, giving the salaries of technical engineers, draftsmen and employees employed by the city of St. Louis, Mo. Some of the salaries are as follows:

Vacations are allowed of two weeks after one year's service.

According to a special ordinance passed October 1, 1918, a war increase in salaries was made as follows: Salaries of $100.00 and less per month, 15% increase; salaries of from $10.00 to $130.00 per month, 10% increase; salaries of from $130.00 to $200.00 per month, 5% increase.

| Title | Per Annum 1st year | 2nd year | 3rd year | 4th year | 5th year & after |
|---|---|---|---|---|---|
| Chief Architect | $3,300.00 | $3,420.00 | $3,540.00 | $3,540.00 | $3,600.00 |
| Senior Architect | 2,400.00 | 2,520.00 | 2,640.00 | 2,760.00 | 2,880.00 |
| Architect | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Designer of Plumbing and Sanitation | 1,800.00 | 1,920.00 | 2,040.00 | 2,100.00 | 2,100.00 |
| Civil Draftsman | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Electrical Draftsman | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Mechanical Draftsman | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Chief Examiner | 3,000.00 | ..... | ..... | ..... | 3,000.00 |
| Chief Civil Engineer | 3,300.00 | 3,420.00 | 3,540.00 | 3,540.00 | 3,600.00 |
| Chief Electrical Engineer | 3,300.00 | 3,420.00 | 3,540.00 | 3,540.00 | 3,600.00 |
| Chief Mechanical Engineer | 3,300.00 | 3,420.00 | 3,540.00 | 3,540.00 | 3,600.00 |
| Civil Engineer | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Division Engineer | 4,000.00 | 4,000.00 | 4,000.00 | 4,000.00 | 4,000.00 |
| Electrical Engineer | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Mechanical Engineer | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Engineer-in-charge Municipal Plants | 2,400.00 | ..... | ..... | ..... | 2,400.00 |
| Engineer-in-charge Testing Laboratory | 2,220.00 | 2,340.00 | 2,460.00 | 2,460.00 | 2,520.00 |
| Senior Civil Engineer | 2,400.00 | 2,520.00 | 2,640.00 | 2,760.00 | 2,880.00 |
| Senior Electrical Engineer | 2,400.00 | 2,520.00 | 2,640.00 | 2,760.00 | 2,880.00 |
| Senior Mechanical Engineer | 2,400.00 | 2,520.00 | 2,640.00 | 2,760.00 | 2,880.00 |
| Plan Examiner | 1,800.00 | 1,920.00 | 2,040.00 | 2,160.00 | 2,280.00 |
| Superintendent of Construction | 1,800.00 | 1,920.00 | 2,040.00 | 2,220.00 | 2,400.00 |
| **Per Month** | | | | | |
| Chief Underground Construction | 125.00 | 135.00 | 145.00 | 145.00 | 150.00 |
| Draftsman Grade 1 (Exm. held Feb. 13, 1919 | 70.00 | 75.00 | 80.00 | 80.00 | 85.00 |
| Draftsman Grade 2 | 90.00 | 95.00 | 100.00 | 100.00 | 105.00 |
| Draftsman Grade 3 | 115.00 | 120.00 | 125.00 | 125.00 | 130.00 |
| Architectural Draftsman | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Civil Draftsman | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Electrical Draftsman | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Junior Architectural Draftsman | 90.00 | 100.00 | 110.00 | 110.00 | 110.00 |
| Junior Civil Draftsman | 90.00 | 100.00 | 110.00 | 110.00 | 110.00 |
| Junior Electrical Draftsman | 90.00 | 100.00 | 110.00 | 110.00 | 110.00 |
| Junior Mechanical Draftsman | 90.00 | 100.00 | 110.00 | 110.00 | 110.00 |
| Mechanical Draftsman | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Asst. Chief Engineer | 150.00 | 160.00 | 170.00 | 170.00 | 170.00 |
| Asst. Civil Engineer | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Asst. Electrical Engineer | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Asst. Mechanical Engineer | 125.00 | 135.00 | 145.00 | 145.00 | 145.00 |
| Junior Electrical Engineer | 90.00 | 100.00 | 110.00 | 110.00 | 110.00 |
| Junior Mechanical Engineer | 90.00 | 100.00 | 110.00 | 110.00 | 110.00 |

In St. Louis the work day is 8 hours. There is no overtime pay. Salaries are paid on the 15th and last day of each month. In case of sickness, full time for pay is allowed for the first two weeks, 75% time for pay allowed for the balance of time sick, not exceeding six weeks.

### Annual Meeting of British Heating Engineers.

The completion of considerable research work was reported at the annual meeting of the Institution of Heating and Ventilating Engineers, which was held in London Feb-

ruary 11. The institution's research committee has a mass of material ready for the printer which will be published when conditions improve. A. H. Barker, in referring to the experiments being conducted at the University College, stated that the methods used for testing heat transmission from radiators had given excellent results.

The principal paper of the meeting was presented by C. R. Honiball on "The Cracking of Cast-Iron Sectional Boilers."

It was decided to hold the summer meeting at York, June 24 and 25.

## Deaths.

WILLIAM F. MCDONALD, secretary of the Michigan Chapter of the American Society of Heating and Ventilating Engineers, chairman of the society's Committee on Increase of Membership and a member of the society's Research Bureau Committee, died at his home in Detroit, Mich., April 26. The immediate cause of his death was a severe cold, but he had not been in robust health for several months or since his breakdown last January.

Mr. McDonald was 42 years old. He had, however, already assumed a place of leadership in the profession and in the society that would undoubtedly have destined him to higher honors. During the past year he had been one of the most active and enthusiastic workers in the heating engineers' society and he had been given a large share of the credit for the society's rapid growth in membership and influence.

As a heating enginer, Mr. McDonald met with success and at the time of his death was at the head of the Wm. F. McDonald Co., of Detroit. In his efforts for the advancement of the profession he had shown himself to be a man of liberal views and progressive, a typical exponent of the new order in engineering cooperation.

EDWARD VITALIUS, chief engineer for the American Blower Co., Detroit, Mich., who was fatally injured in the trolley wreck of the Detroit Union Railway, near Oxford, Mich., had been connected with the American Blower Company since he was 15 years old. At the time of his death he was 43 years old. He started with the company as a messenger in the engineering department. His aggressiveness and energetic disposition brought him rapid promotion and at the time of his untimely death he had full charge of the entire engineering activities of the company, with the title of chief engineer. His relation with his business associates were such that his loss is considered irreparable.

Mr. Vitalius was endowed with a wide and unusual knowledge of engineering as related to heating, ventilating and drying and had a national reputation as a designer of equipment for automatically controlling temperature and humidity in bakeries, for the purpose of insuring uniformity in the quality of the various doughs.

He was a member of the Detroit Athletic Club, Detroit Engineering Society and of the American Society of Heating and Ventilating Engineers. He was also a member of Ashlar Lodge, F. & A. M. He leaves a widow, mother, brother and sister.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at Cooperstown, N. Y., for April 1, 1919.

County of New York, }
State of New York. } ss.

Before me, a notary public in and for the State aforesaid, personally appeared A. S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the Editor of THE HEATING AND VENTILATING MAGAZINE, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443 Postal Laws and Regulations printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher editor, managing editor, and business managers are:
Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.
Editor, A. S. Armagnac, 1123 Broadway, New York, N. Y.
Managing Editor, None.
Business Manager, Gustave Petersen, 1123 Broadway, New York, N. Y.

2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the names and address of stockholders owning or holding 1 per cent or more of the total amount of stock.)
Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.
A. S. Armagnac, 1123 Broadway, New York, N. Y.
Gustave Petersen, 1123 Broadway, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holdoing 1 per cent or more of total amount of bonds, mortgages, or other securities are:
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumsances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than that of a bona-fide owner and this affidavit has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

A. S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 4th day of April, 1919.

A. J. VANDEN BULCKE,
Notary Public, Bronx Country, New York.
Cert. filed in New York County.
(My commission expires March 30, 1920.)

# What Would You Think of a Manufacturer—

—who wrote to you with a lead pencil—"We are saving much money because we do not use typewriters and telephones?" You might well wonder whether his merchandise was as much out of date as his business methods.

You know that modern time and labor saving appliances are not added expenses, but that they have superseded slower and more costly processes.

The concern which uses your business paper to tell you its business story is simply using a modern piece of selling machinery to make it easier for you to buy intelligently with the least waste of your time and theirs.

For the right kind of advertising shortens the distance between human minds just as certainly as the railroad shortens the distance between places. It is still possible to walk from New York to Chicago, and it is still possible for a business to get along without advertising, BUT—

—bear in mind that the seller who does not advertise does NOT save the cost of advertising, for it costs more to do the work of advertising by other means. Consistent advertisers are progressive merchandisers, and it pays to do business with them.

**You are invited to consult us freely about Business Papers or Business Paper Advertising.**

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Electrical World
Embalmers Monthly
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Factory
Farm Machinery Farm Power
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Furniture Manufacturer & Artisan
Furniture Merchants' Trade Journal
Gas Age
Gas Record
Grand Rapids Furniture Record
Haberdasher
Hardware Age
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Hotel Monthly
Illustrated Milliner
Implement and Tractor Age
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Mining and Scientific Press
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Motor World
National Builder
National Druggist
National Petroleum News
Nautical Gazette
Northwestern Druggist
Power
Power Boating
Power Plant Engineering
Price Current Grain Reporter
Railway Age
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Retail Lumberman
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## CAPACITY OF STEAM MAINS IN SQUARE FEET OF EQUIVALENT DIRECT RADIATION.

**For a Total Pressure Drop of 1 Lb.**

*Square Feet of Equivalent Direct Radiation.*

| Size of Pipe In. Diam. | 100 | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 | Size of Pipe In. Diam. |
|---|---|---|---|---|---|---|---|---|---|---|
| ¾ | 80 | 58 | 46 | 40 | | | | | | ¾ |
| 1 | 180 | 132 | 104 | 92 | 80 | 62 | 58 | 52 | | 1 |
| 1¼ | 334 | 236 | 194 | 168 | 150 | 122 | 106 | 94 | 86 | 1¼ |
| 1½ | 554 | 390 | 308 | 266 | 246 | 202 | 174 | 158 | 144 | 1½ |
| 2 | 1218 | 900 | 750 | 650 | 590 | 500 | 420 | 370 | 350 | 2 |
| 2½ | 2120 | 1450 | 1200 | 1050 | 960 | 800 | 680 | 600 | 550 | 2½ |
| 3 | 3850 | 2700 | 2200 | 1880 | 1700 | 1400 | 1250 | 1200 | 1000 | 3 |
| 3½ | 5500 | 3900 | 3150 | 2720 | 2500 | 2000 | 1800 | 1600 | 1450 | 3½ |
| 4 | 7700 | 5450 | 4450 | 3820 | 3450 | 2800 | 2500 | 2200 | 2050 | 4 |
| 4½ | 10320 | 7250 | 6920 | 5100 | 4600 | 3750 | 3300 | 3000 | 2750 | 4½ |
| 5 | 13660 | 9700 | 7950 | 6820 | 6180 | 5000 | 4450 | 4000 | 3650 | 5 |
| 6 | 22000 | 15550 | 12800 | 10950 | 9700 | 8050 | 7200 | 6400 | 5800 | 6 |
| 7 | 32000 | 23000 | 18650 | 15920 | 14200 | 11600 | 10200 | 9400 | 8350 | 7 |
| 8 | 45000 | 32000 | 26000 | 22400 | 20000 | 16200 | 13600 | 12600 | 12000 | 8 |
| 9 | 60000 | 44000 | 34000 | 30000 | 27000 | 22000 | 18800 | 16800 | 15600 | 9 |
| 10 | 80000 | 58000 | 46600 | 40000 | 36000 | 29200 | 25400 | 23000 | 21000 | 10 |
| 12 | 126000 | 90000 | 73500 | 63620 | 56800 | 46000 | 39400 | 36200 | 33600 | 12 |
| 14 | 170000 | 120000 | 94800 | 82000 | 73000 | 59000 | 51600 | 47000 | 42800 | 14 |
| 15 | 200000 | 140800 | 114000 | 98200 | 87000 | 71000 | 61000 | 55400 | 51000 | 15 |
| 16 | 238000 | 170000 | 140000 | 121000 | 108000 | 87200 | 75800 | 68400 | 62000 | 16 |
| 18 | 320000 | 228000 | 186000 | 160000 | 144000 | 118000 | 102000 | 91000 | 84000 | 18 |
| 20 | 400000 | 284000 | 230000 | 200000 | 180000 | 146000 | 126000 | 115700 | 104000 | 20 |

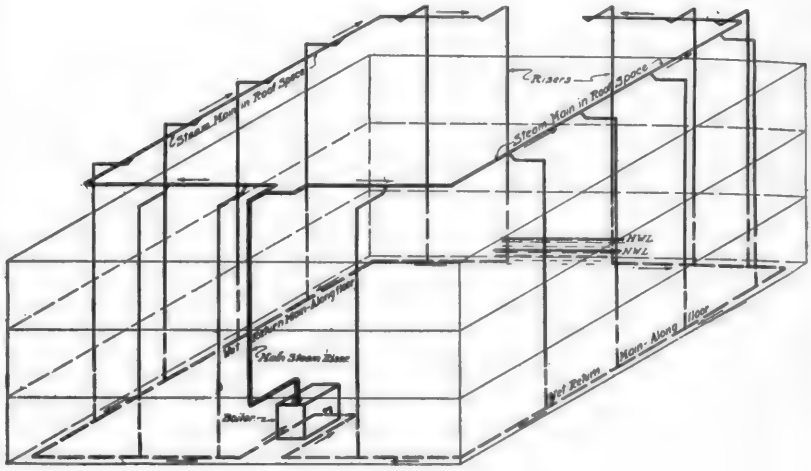
## SIZES OF STEAM PIPES.

| E. R. D. in Sq. Ft. | Steam Mains. One-Pipe In. Diam. | Steam Mains. Two-Pipe In. Diam. | Steam Risers. One-Pipe In. Diam. | Steam Risers. Two-Pipe In. Diam. |
|---|---|---|---|---|
| 30 | 1½ | 1¼ | 1¼ | 1¼ |
| 100 | 2 | 1½ | 1½ | 1½ |
| 150 | 2 | 1½ | 2 | 1½ |
| 200 | 2½ | 2 | 2½ | 2 |
| 250 | 2½ | 2 | 2½ | 2 |
| 300 | 3 | 2½ | 3 | 2½ |
| 400 | 3½ | 3 | 3 | 2½ |
| 500 | 3½ | 3 | 3 | 3 |
| 600 | 3½ | 3½ | | |
| 800 | 4 | 3½ | | |
| 1000 | 4½ | 4 | | |
| 1500 | 5 | 4 | | |
| 2000 | 5 | 4½ | | |
| 3000 | 6 | 5 | | |
| 4000 | 7 | 6 | | |
| 6000 | 8 | 7 | | |

(Harrison Safety Boiler Works)

## ONE PIPE STEAM SYSTEM.

### Mills System.




THE MILLS SYSTEM.

For jobs where the quantity of radiaton goes up to say, over 600 sq. ft. per riser, it is better to use the overhead, or "Mills" system. This system and the "one-pipe relief" system more nearly approach a two-pipe job, having both steam main and a return main, but can be made in the one-pipe variety by using one radiator connection, with a single valve. A diagram of the well-known Mills system is shown herewith and it will be noted that all the steam is carried up one main riser to overhead mains run around the top of the building and pitched down from the main riser to the various drops. The drops have tees at the re-run around the top of the building and pitched down from the main at the top from the riser itself and from the radiators connected thereto, falls down through the drops—flowing with the steam all the way—and is finally drained off drips connected to the bottom of the drops and going to the main return—preferably a wet return, through which they find their way back to the boiler.

The Mills system establishes more nearly ideal conditions and should be used for higher building jobs, but is a more expensive system to install than either the "one-pipe circuit" or the "one-pipe relief." In spite of this it should be used for all larger work where the other two systems would be liable not to give satisfaction.

## ONE-PIPE STEAM SYSTEM.

### Radiator Connections.

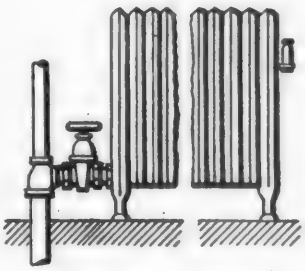


FIG. 1

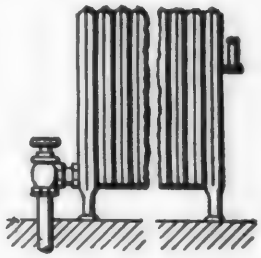


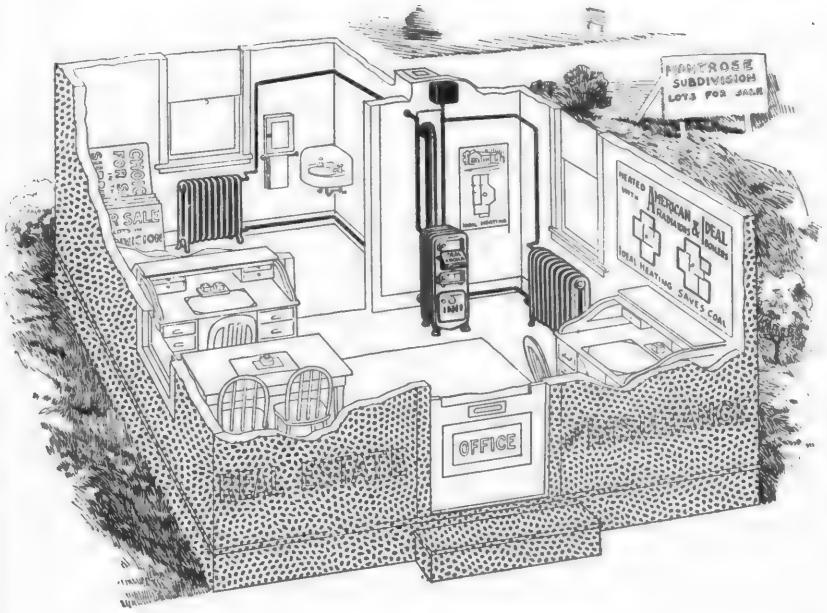
FIG. 2

A system which is theoretically correct, but wrong in smali details, never gives satisfactory service any more than a system rightly installed in the details, but theoretically wrong in the general idea.

In all one-pipe work the steam connection to the radiator is practically the same; the connections must be made at the bottom and must be controlled (as shown in Figs 1 and 2) by a gate valve or angle globe valve looking down, both of these points being determined by the necessity of accommodating the flow of the condensation out of the radiator. The automatic air valve should be placed on the opposite end of the radiator from the steam valve and about one-third to two-thirds of the height of the radiator above the bottom. The runouts, of course, must be arranged to provide for expansion in the riser.

# IDEAL Arcola Hot Water Heating Boiler

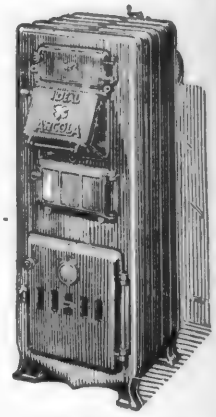
## *For cellarless small houses and flats*




This illustrates the simplicity of installation of an IDEAL Arcola Boiler and two AMERICAN Radiators in a cellarless small office building. The piping is, of course, ordinarily run out of sight, within walls or partitions.

The architect has in the IDEAL Arcola a most satisfactory solution of the individual heating demands of his factory and community housing plans. In general purpose like a stove, heating the room in which it is placed, but unlike a stove, providing circulating hot water for radiators in adjoining rooms. Great fuel saving, together with the desirable and equitable warmth of Hot Water Heating, is secured.

**Write today for special literature illustrating and describing the IDEAL Arcola**



The IDEAL Arcola is both a Boiler and a Radiator

# AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

# TRADE AND MISCELLANEOUS NOTES

### Coming Events.

**June 11, 1919.**—Annual convention of the National Warm Air Heating and Ventilating Association, in Columbus, O. Secretary, Allen W. Williams, Columbia Building, Columbus.

**June 10-12, 1919**—Summer meeting of The American Society of Heating and Ventilating Engineers in Pittsburg, Pa.

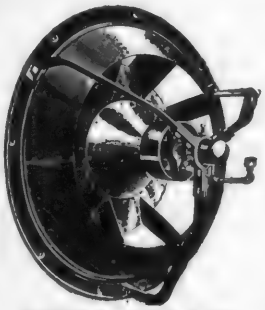
**June 10-13, 1919.**—Annual convention of the National District Heating Association, in Pittsburgh, Pa.

**June 12-14, 1919.**—Annual convention of the Heating and Piping Contractors' National Association (formerly National Association of Master Steam and Hot Water Fitters) in Atlantic City. Headquarters at the St. Charles Hotel.

**June 17, 18 and 19, 1919.**—Annual convention of the National Association of Master Plumbers in Atlantic City, N. J. Headquarters at the Hotel Breakers.

### Miscellaneous Notes.

**Central heating plants** are one of the features of the housing campaign in Great Britain, according to a report of the committee appointed by the Ministry of Reconstruction from the Women's Advisory Council. The committee would also center the laundering and cooking of the community in a community laundry and a community kitchen. It would also build a community center school building, with café and garden where families might eat and dance. Recommendations are made that the walls and floor of community buildings be made of tile so that they can be easily washed. In connection with the communal cooking idea, the committee states that it does not seem probable that communal kitchens to which women could come and cook for themselves will find favor. The solution of communal cooking would seem to lie in the supply of varied

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which are installed by us complete with **Motors, Duct Work** and **Wiring.**

**Aligning, Rigging** and **Hoisting** done, with labor thoroughly qualified from long experience.

We make a specialty of **Kitchen Exhaust** work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations.

The **Duplex Cone** Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The **Blackman** Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.

SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

and wholesome cooked foods at reasonable prices.

**Radiator prices** have again been reduced, the latest quotations being: 15% reduction on all direct radiators, 12½% on wall radiators and 10% on steam and hot water boilers. This change, together with a similar announcement of January 10, approximates a decline of 36% on radiators and 33% on boilers from the prices in effect prior to January 1, 1919. During this period, it is stated, pig iron prices have declined but 20%, and the rates for labor have not been reduced. Production costs therefore do not warrant this readjustment of prices, but at this time profits are secondary to a general resumption of building activity.

**Professor A. L. Harris,** of the architectural department of George Washington University, who has been on leave of absence for a year to engage in special war work for the Navy Department, has returned to the faculty of the university and has resumed his classes in heating, ventilation and sanitation; and wood and masonry construction.

**Dallas, Tex.**—The Board of Education has engaged a local expert to survey the


# ILGAIR UNIT HEATERS

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# BROADER MARKET

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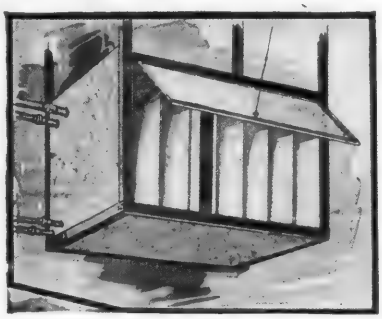

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**For large open spaces—where the initial and maintenance costs of both direct radiation and blast systems are often objectionable—you will find Ilgair Unit Heater a correct and economical solution.**

**Remarkably low power consumption, extremely low amount of radiation.**

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**ILG ELECTRIC VENTILATING CO.**

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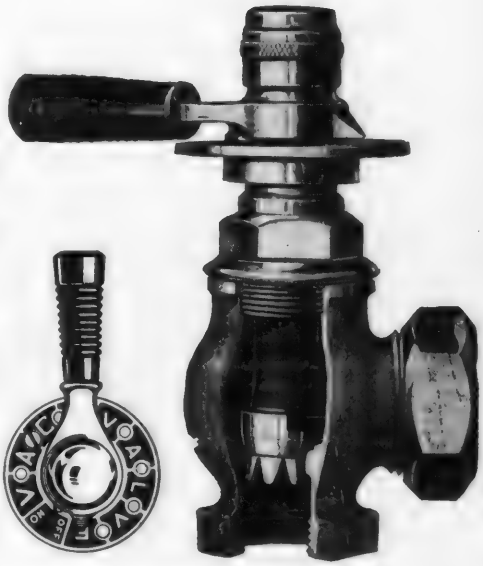
# DETROIT PACKLESS RADIATOR VALVES

## The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.



**DETROIT PACKLESS**
**Vacu Valve showing Dial Plate and Lever Handle**

**Booklet VP-1 Gladly Sent Upon Request**

**DETROIT LUBRICATOR COMPANY**
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY LTD WALKERVILLE, ONTARIO

**LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD**

heating and ventilating conditions in all of the Dallas schools.

**Denver, Colo.**—High-pressure heating plants in the Cheltenham, Franklin, Emerson and Sherman schools have been converted into low-pressure plants, in accordance with the school board's plan of eliminating the necessity of employing licensed engineers in the public schools. It is expected that in a few weeks all of the public schools will be operating on low pressure.

**Evansville, Ind.**—Announcement was made at a recent meeting of the Vanderburgh County Anti-Tuberculosis Society that a campaign for $25,000 with be inaugurated this fall for a central heating plant for Boehne Camp.

**Washington, D. C.**—Formal complaint of unfair competition has been made by the Federal Trade Commission against the Ruud Mfg. Co. and the Pittsburgh Water Heater Company, both of Pittsburgh, manufacturers of instantaneous automatic gas water heaters, on the ground that the commission has reason to believe, from a preliminary investigation, that the concerns by agreements and understanding have adopted fixed prices at which their products shall be resold to dealers and have refused to sell to dealers who insist on reselling to the public at their own prices.

**Scranton, Pa.**—A campaign to compel county authorities to tax the coal corporations on their unmined, as well as on their mined, coal, has been started by several local labor organizations, including the local chapter of the United Association of Steam Fitters. According to the resolutions adopted taxes should be levied on some 790,000,000 tons of coal still unmined in Lackawanna County and on 200,900,000 tons in the Scranton district.

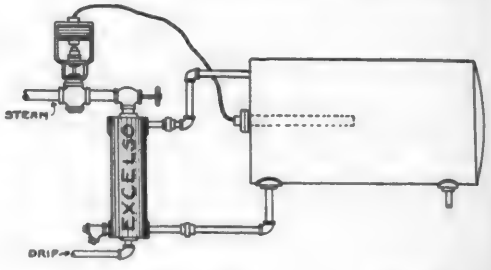
**Indianapolis, Ind.**—Twenty-three public school buildings have been designated for heating and plumbing improvements by the Board of School Commissioners, involving an expenditure of $375,000. Snider & Rotz, consulting engineers for the board, have been ordered to prepare plans and specifications for the improvements.

**Springfield, Mo.**—A brick, with rope and packing wrapped around it, was removed recently from the steam line back of Burnham Hall, at Drury College, solving


**EXCELSO HEATERS FOR STORAGE TANKS**

**Large Heating Surface**
**Quick and Efficient**

The Heater may be connected in many different ways to storage tanks and may be used with or without thermostatic control. It may also be used with or without the storage tank, either singly or in multiples with or without thermostatic control.

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# PIPE BENDING

## MARINE EQUIPMENT AND REPAIR WORK
## HEATING AND VENTILATING

**THE OHIO HEATING AND PIPE BENDING CO.**

**Main Office and Factory, 1061-63 West 11th Street, Cleveland, Ohio**

SOLE AGENTS FOR

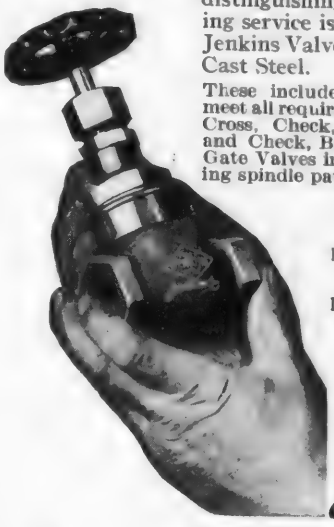
**F. J. Nice Oil and Combination Oil and Gas Burners**

the mystery of the heat supply to Stone Chapel and the vocal studio. For several years it has been practically impossible to heat these buildings even when steam was turned off from the other three buildings on the campus. As soon as the brick was removed the buildings were readily heated.

**Maine Plumbing, Steam and Metal Salesmen's Association** held its annual meeting and dinner at the Moulton House, Dunstan, Me., March 10. A novel initiation stunt was carried out in admitting a new member to the "United Order of Bushwhackers." New officers were elected as follows: President, George H. H. Lawton, Portland Stove Foundry Co., Portland; first vice-president, Joseph E. Herrick, National Radiator Co., Johnstown, Pa.; second vice-president, Everett F. Mann, Austen & Doten, Boston; third vice-president, Harry P. Stiles, Stiles Engineering Specialty Co., Boston; treasurer, A. M. Rosebrook, Gurney Heater Mfg. Co., Boston; recording secretary, E. H. Winslow and Co., Portland, Me.; financial secretary, R. C. Parker, Smith & Abbott Co., Portland.

**Building permits** for March, 1919, reported to the *American Contractor* from


## Experienced Hands Demand the Jenkins "Diamond Mark"



The Jenkins "Diamond" the distinguishing mark of unvarying service is on the body of all Jenkins Valves—Brass, Iron and Cast Steel.

These include types and sizes to meet all requirements; Globe, Angle, Cross, Check, Combination Stop and Check, Blow Off, Whistle and Gate Valves in stationary or traveling spindle patterns.

JENKINS BROS.
New York Boston
Philadelphia Chicago
Montreal London, E. C.
2008-J

REG. U.S. PAT. OFF. TRADE JENKINS MARK
Jenkins Bros.

Jenkins Valves

## Adjustment cost with this trap—is nothing

YOU can "take off" from a blueprint within 3% of your pipe runs. You can count the radiators from the plan but whoever guessed the labor item in cleaning up a job?

Adjusting traps comes under that head. A balky trap can eat up $s worth of time on every floor. A badly adjusted trap can spoil the architect's disposition.

You can't afford this and there's no reason for it if you'll use the Johns-Manville Radiator Trap.

Because there are no thermostatic parts or restricted air passages, no counter weights or regulating screws, there is nothing to get out of order. There are but three parts—a body, connecting union and a seamless hollow metal ball that floats freely on the water in the trap.

We'll send our special bulletin if you'll ask for it.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

And also through—
Asbestos
and its allied products
JOHNS-MANVILLE Serves in Conservation
Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Prevention Products

JOHNS-MANVILLE
Radiator Trap

West Philadelphia High School

## Where the Consulting Engineer

designs a ventilating system for a school house, he should insist that the Architect provide for the installation of an Air Washer.

Should it be necessary to cut down the cost of the building, some of the decoration should be omitted or part of the building should be left unfinished rather than endanger the health of the child by omission of one of the most important features in the mechanical equipment.

**Webster Air Washers with Humidity Control**

are recognized for their superiority and in the City of Philadelphia alone 30 school buildings are equipped with our apparatus.

ATMOSPHERIC
CONDITIONING CORPORATION
Lafayette Building
PHILADELPHIA

162 cities, show that the long-expected building boom has begun. The gain over the corresponding month last year is 71%, being $60,176,987, as compared with $35,315,327. This showing supplements that for February, 1919, which recorded a gain of 48% over February, 1918.

### Manufacturers' Notes.

**Thermal Appliance Co.**, New York, announces the removal of its general offices, laboratory and factory to Elizabethport, N. J., where a plant comprising two large brick buildings with 7500 sq. ft. of floor space will be occupied.

**Consolidated Car Heating Co.**, North Albany, N. Y., is planning to remove its plant to Albany. The plant will be greatly increased in capacity, giving Albany the distinction of having the largest car heating manufacturing plant in the country. Claude C. Nuckols is manager of the company.

**H. W. Johns-Mansville Co.**, New York, will spend $3,000,000 on its new plant at Waukegan, Ill., plans for which have been drawn by Herman J. Esser, architect, Milwaukee, Wis. The new plant, which will be similar in design and equipment to the New Jersey works, will be equipped for

## Sets of Standard Data Sheets at Special Prices

Standard heating data sheets, which are published each month in The Heating and Ventilating Magazine, are now complete for such subjects as "Tables of Heat Transmission Factors," "Methods of Computing Heat Losses," "Air Changes," Ducts and Flues (including seven different methods of sizing)," "Chimneys" and "Fittings."

For the benefit of those desiring extra sheets, printed on one side only, covering any particular topic, we are able to make the following offer.

| | |
|---|---|
| Set No. 1—B. T. U. Losses, 8 sheets | 25 cents |
| Set No. 2—Computing Heat Losses, 6 sheets | 20 cents |
| Set No. 3—Air Changes, 5 sheets | 15 cents |
| Set No. 4—Ducts and Flues (including seven methods of sizing), 24 sheets | $1.00 |
| Set No. 5—Chimneys, 13 sheets | 50 cents |
| Set No. 6—Fittings, 13 sheets | 50 cents |

Any of these sets will be mailed postpaid, on receipt of price. Order by number of set. Copies of other data sheets, printed separately on one side only, 5 cents each, postpaid.

Address

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York

Sirocco"

TRADE MARK

# Speeds Up Production

In these days of rush work, with everything strained to the limit, fresh pure air for the factory is of vital importance.

The Sirocco System of Heating and Ventilating is used by many of America's best known and most successful manufacturers.

The view above shows an installation in a factory noted for its production and efficiency methods.

In the "dog days" of summer the Sirocco System is invaluable in keeping the factory workers fresh and fit by supplying the proper amount of fresh, pure air to every nook and corner.

Let us tell you more about Sirocco for your factory—Ask for Bulletin No. 270.

## American Blower Company

DETROIT, MICHIGAN

BRANCHES IN ALL PRINCIPAL CITIES

the manufacture of asbestos goods, automobile accessories, electrical supplies, etc.

**Power Specialty Co.,** Danville, N. Y., manufacturer of the Foster superheater, will shortly market a new fuel-saving device which is under development.

**Bayley Mfg. Co.,** Milwaukee, Wis., has increased its capital stock from $140,000 to $250,000. The company, which manufactures the Bayley line of fans and blowers, has taken over a controlling interest in the C. Colnik Mfg. Co., of Milwaukee, manufacturers of structural and ornamental iron. This plant will be adapted for the manufacture of fans and blowers. Eugene Worthing is president of the company.

**United States Radiator Corporation,** Detroit, Mich., held the annual conference of its branch and plant managers in Detroit recently. One of the principal items taken up at the conference was the manufacturing process, with a view of making this process so perfect that the steam fitter can make his installation at a minumum of expense for labor.

**American Blower Co.,** Detroit, Mich., has purchased 28 acres on the Detroit Terminal Railroad, north of Grinnell Avenue, near Gratiot Avenue and French Road, for about $125,000. It is reported that the company will use this site for a new $750,000 plant which will supplement the company's present manufacturing facilities.

**Niagara Radiator & Boiler Co.,** North Tonawanda, N. Y., has taken over the business of the Buffalo Radiator Company, which was owned by the W. A. Case & Son Mfg. Co., of that city. It is stated that the manufacture of Buffalo radiators will be continued. Edwin C. Andrews is president of the Niagara Radiator & Boiler Co.; A. M. Eberhart is vice-president and W. S. Newkirk, secretary.

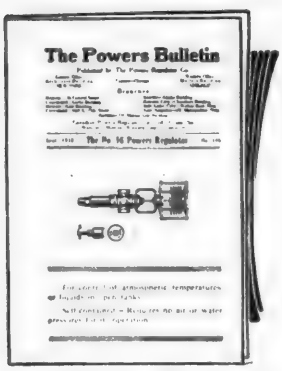
GOLD HEATING & LIGHTING NEW YORK U.S.A.

**GOLD'S THERMOSTATIC HEAT REGULATING SYSTEM**

Operated entirely by ELECTRICITY.
Each room is a unit by itself.
Does not depend on an air compressor.
Requires no attention whatever.
Is free from all troubles which usually affect such devices.

GOLD CAR HEATING & LIGHTING CO.
17 Battery Pl. (Whitehall Bldg.) New York

TEMPERATURE CONTROLLING APPARATUS




Our Bulletins give concise, accurate information about Powers Regulators. Tell us what place or process needs heat control, and we'll send you the Bulletins that give pertinent facts, typical cases, etc. Free for the asking.

# Can You Lower Prices?

***Prices—Costs—Wages*—those are the words heard most frequently when business men get together.**

If wages are to stay up, manufacturers must take advantage of every possible device and method that will *save* labor or cut down other costs in any way.

That's why so many are asking us about our methods of heat control—methods that save labor, coal, material, and time.

Wherever heat is used, whether in factory processes or to warm rooms, there is a certainty that a real saving can be effected by applying a Powers Regulator at the right point.

Powers Regulation is not a cure-all—not a generality—but it provides specific treatment for specific conditions.

Heat Regulation has been our sole business for over thirty years. In that time we have solved many problems, and gained a rich fund of experience, which is freely at your service.

The Powers Regulator Co.
Specialists in Automatic Heat Control
954 Architects Bldg., New York. 2143 Mallers Bldg., Chicago
365 The Federal Street Bldg., Boston
The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

Buffalo
Equipped
THE prominent buildings in all parts of the country are equipped with
Buffalo Heating and Ventilating Apparatus
It puts heat, mechanically, just where it is wanted, keeps it in circulation and prevents it from escaping through the ventilators in in the roof until it has been used to the best advantage. Saves coal—increases efficiency of workers.
Catalog No. 198-36 gives valuable engineering data on heating and ventilating problems and our engineering department is always available for consultation.
Buffalo Forge Company
Buffalo, N. Y.
Offices in all Principal Cities
"Buffalo"

**American Radiator Co.,** Chicago, Ill., has declared an extra dividend of 4% on its common stock, payable in Fourth Liberty bonds and in War Savings stamps.

**Atlantic Radiator Co.,** New York, announces the election of R. C. Schoerer as president and treasurer, and H. T. Gates, as vice-president and secretary. Mr. Gates is also general manager of the company. The company announces the opening of a new branch office in Rochester, N. Y., at 260 Plymouth Street. George S. Manson, formerly with the Spencer Heater Company, is manager.

**J. B. Wise, Inc.,** Watertown, N. Y., announces the election as president and treasurer of L. C. Mitchell, to succeed C. R. Wise, who died recently.

**Thompson Heater Corporation,** Buffalo, N. Y., has increased its capital stock from $150,000 to $175,000.

**American Blower Co.,** Detroit, Mich., announces that its St. Louis office in the Boatman's Bank Building, is now in charge of Thomas Chester, formerly connected with the engineering department of the company's New York office. Mr. Chester had won an enviable place for himself in metropolitan trade circles and the good wishes of a wide circle of friends accompany him in his new duties.

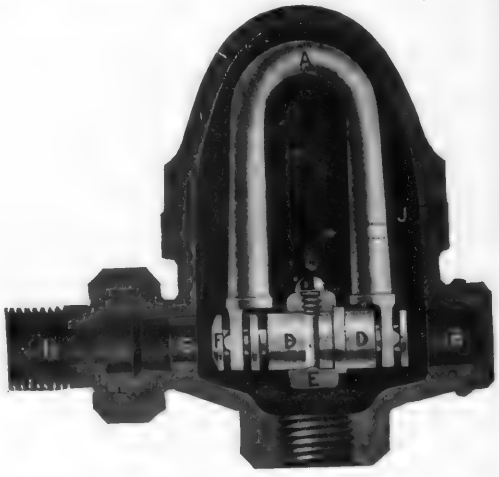
**Bailey Meter Co.,** manufacturers of the Bailey line of fluid meters and boiler meters, announces the removal of its main office and works from Boston to Cleveland, Ohio. The Boston office, with H. D. Fisher as manager, will be continued to handle sales and engineering service work in the New England district. For the present, the New York and Philadelphia districts will be covered from Boston and all other districts will be covered from Cleveland.

**Union Radiator Co.,** Johnston, Pa., has opened new branch offices in Chicago and Pittsburgh. The Chicago office, at 1507 Lytton Building, 14 East Jackson Boulevard, is in charge of Charles O. Lindhal, formerly with Hart and Crouse Co., Utica, N. Y. It is stated that warehouse facilities in Chicago will permit an ample stock to be carried for the convenience of the trade in that district. The Pittsburgh branch is in the Empire Building, Pittsburgh, and is in charge of H. W. Arthur, formerly located at the company's plant in Johnstown.


# Why Experiment with an Unproved Device?

All Haines Automatic Valves and Traps are guaranteed absolutely for a period of five years, when used on vacuum or low-pressure heating systems.

These valves were built right in the first place. That's why it has not been necessary to change the principle of their thermostatic tube as originally designed.




HAINES VENTO TRAP
Recommended for use with cast iron radiation with low pressure steam.
Not exceeding 10 lbs.

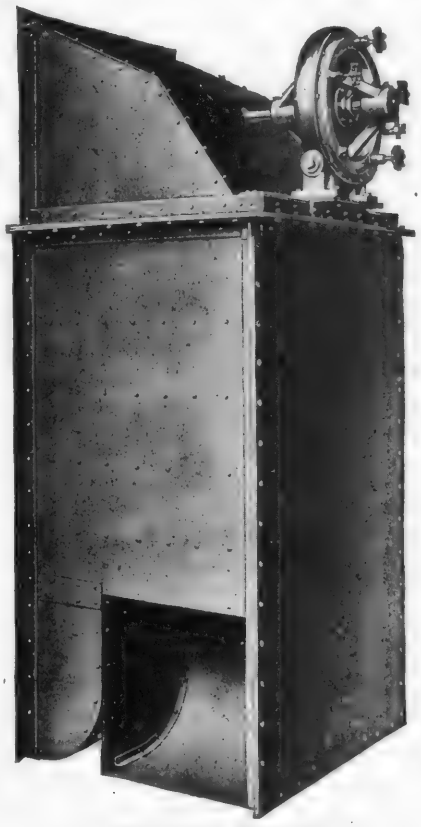
***Send for latest catalogue***

**WM. S. HAINES & CO., Philadelphia, Pa.**

# THE UNIT HEATER

was first placed in use in 1870 by B. F. Sturtevant, founder of the B. F. STURTEVANT COMPANY. Since that time, through careful study and engineering practice, the present day Portable Unit Heater has been perfected. It is just one of the large and growing family of

Sturtevant
(REG. U.S. PAT. OFF.)



Independent Unit Heater

Its relation to the heating of shops and factories is similar to replacement of the old line shafting, by the unit motor drive.

It eliminates expensive, cumbersome overhead piping; it warms just the portion you wish heated; the exhaust steam from the small turbine, driving the disc or propeller fan, heats the steam coils. Its economy is apparent, and its efficiency has been proven.

The following are typical users:

HYDRAULIC PRESSED STEEL CO.
AMERICAN LOCOMOTIVE CO. (5 plants)
BATES MACHINE CO.
CLEVELAND WINDOW GLASS CO.
SCOVILLE MFG. CO.
MERRILL SILK CO.

Our Engineering Staff, with the benefit of this fifty years of experience is at your service. Estimates given without obligation.

## B. F. STURTEVANT COMPANY
### Hyde Park, Boston, Mass., U. S. A.
AND ALL PRINCIPAL CITIES

**American Pressweld Radiator Corporation,** Detroit, Mich., announces the election of the following officers for 1919: President, C. H. O. Meyer, vice-president, R. S. Drummond; treasurer, H. F. Hiney; secretary and manager, John A. Irwin. Mr. Drummond was formerly vice-president and general manager of the Detroit Steel Products Company and Mr. Hiney was associated with him at the Detroit Steel Products Company. The company, it is stated, is bringing out several new products and under the new management will undertake an aggressive manufacturing and selling policy of the various Pressweld products.

**Holland Furnace Co.,** Holland, Mich., has filed articles of incorporation at Springfield, Ill., to transact business in Illinois. The capital stock of the Illinois company is $100,000 and the principal place of business, Rockford.

### New Firms and Business Changes.

**Reed Plumbing & Heating Co.,** Davenport, Ia., has field articles of dissolution. H. F. Schulze is president and M. V. Schulze, secretary.

**York Heating and Ventilating Corporation,** York, Pa., has opened a Philadelphia office at 250 South Broad Street, in charge of O. N. Walther, treasurer. This corporation is the outgrowth of the York Heating and Ventilating Company of which Howard J. Longenecker is president and manager. Mr. Walther, who is treasurer of the corporation, was formerly assistant to the chief engineer of the Buffalo Forge Company and was later heating and ventilating engineer for the Goodyear Tire & Rubber Company. He served during the war as lieutenant in the Chemical Warfare Section, Mechanical Research and Development Division.

**Charles Morrison,** Boston, Mass., has opened an office at 92 Pearl St., Boston, as manufacturers' agent for the sale of boilers, radiators and specialties for steam, hot water and vapor heating. He was formerly connected with the Walker & Pratt Mfg. Co., of Boston, and has long been a well-known figure in the heating trade.

**Cuyler-Hughes Co.,** New York, is the title of a new firm which will engage in engineering and contracting for heating-ventilating and plumbing work. The com-


# "YOU SAVED US $75,000.00 THE FIRST SUMMER"

That's what the Superintendent of a large chewing gum manufacturer told one of our Engineers last week.

The saving was effected by installing Carrier air conditioning equipment for *manufacturing weather* to order. Summer conditions of temperature and humidity made it necessary for them to close down during the summer season. Carrier equipment enabled them to manufacture their own weather and operate at full capacity and maximum efficiency throughout the year. Carrier equipment, as we say it, makes "Every day a *good* day."

It is doing this in hundreds of places, in more than a hundred different industries, from chewing gum to gunpowder.

Have you read our bulletins? Ask for 100-V, for a starter.

*Write right now*

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

Carrier Engineering Corporation

"EVERY DAY A *GOOD* DAY"

39 Cortlandt St., New York, N. Y.

BOSTON BUFFALO CHICAGO, ILL. PHILADELPHIA

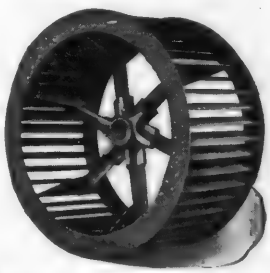
**HOTEL COMMODORE**

*Warren & Wetmore, Architects*
*Baker, Smith & Co., Heating and Ventilating Contractors*

# EQUIPPED THROUGHOUT WITH MASSACHUSETTS FANS

Capacity, efficiency and economy of operation were the determining factors in the selection of the ventilating equipment for this hotel and the reason for the installation of seventeen Massachusetts Blower Company's Fans whose combined capacity is 853,150 cubic feet per minute.

*Condensed Bulletin for Architects and Engineers sent Free on Request*



**MASSACHUSETTS BLOWER COMPANY**
**Watertown, Mass.**
**NEW YORK BOSTON CHICAGO**
**Branches in 20 Principal Cities throughout the Country**

100-5

pany has opened offices in the Longacre Building, 1476 Broadway, New York. The firm is composed of David Cuyler, who has been connected with the heating and ventilating trade in New York for several years and Thomas J. Hughes, who has handled erection work for several of the larger heating concerns in the metropolitan district. Mr. Cuyler and Mr. Hughes met while engaged on government work at one of the amunition plants during the war, and the friendship begun at that time has resulted in the present business arrangement.

**M. J. Gibbons,** Dayton, O., has discontinued his heating, ventilating and plumbing contracting business to conduct a wholesale business in heating and plumbing supplies under the name of the M. J. Gibbons Supply Company, with offices and salesrooms at 601-615 East Monument Avenue, Dayton. For the past 44 years Mr. Gibbons has conducted what became one of the largest heating and plumbing establishments in the Middle West. James F. Gibbons, formerly superintedent for M. J. Gibbons, is now manager of the new Hotel Gibbons, formerly the Algonquin Hotel, which is owned by M. J. Gibbons. Warner H. Kiefaber is sales manager and M. J. Gibbons, Jr., is general manager of the M. J. Gibbons Supply Company.

### New Incorporations.

**W. K. Moran & Co.,** New York, capital $25,000, to conduct a steam heating and plumbing business. Incorporators: G. Stumpf, J. G. Moran and W. K. Moran, 405 Lexington Avenue, New York.

**Eastern Engineers & Contractors' Supply Co.,** New York, capital $50,000, to deal in articles used in heating, ventilating, power, plumbing and other lines. Incorporators: C. A. Brodek, H. Brill, 44 Cedar St., and R. H. Raphael, 2 Rector St., New York.

**Toombs Mfg. Co.,** Geneva, N. Y., capital $15,000 to manufacture water heaters. Incorporators: Charles A. Olson, C. H. Toombs and Fred P. Toombs.

**Standard Heating & Lighting Co.,** Springfield, Mass., capital $50,000, to deal in heating and lighting devices. Incorporators: Arthur G. Taylor, Max Heyman and Frederick H. Dumleton, of Springfield; and Ralph H. Benson and Raymond L. Myrer of Worcester.

**Rhode Island Humidifier & Ventilating Co.,** Boston, Mass., capital $50,000, to

## Connect and Hang Up

That's all that is necessary. Simplest installation possible. Just take your

# SARCO
## TEMPERATURE REGULATOR

Connect the valve in the steam line and hang the thermostat on the wall—No need to watch your steam line or radiators—SARCO takes care of all that—sensitive, automatic, certain and accurate, SARCO is the simplest and most efficient device of its kind on the market.

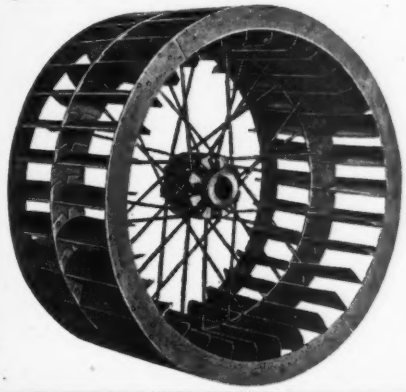
*Read Circular No. P-30 and be convinced*

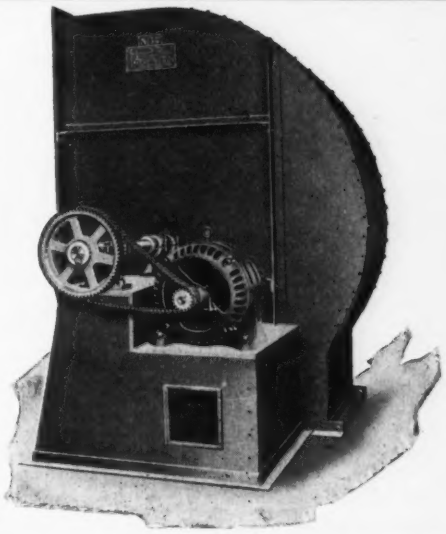
**SARCO COMPANY, Inc.**
**Woolworth Building, New York City**

Ellicott Square, Buffalo
Drexel Bldg., Philadelphia
Williamson Building, Cleveland
Majestic Bldg., Detroit
and Representatives in all Principal Cities.
Canada, Peacock Brothers, Montreal
Monadnock Block, Chicago
Healey Bldg., Atlanta

# The Fan and the Wheel
# PLEXIFORM

Maximum air delivery against low or medium-high resistance from a minimum of housing
Highest obtainable mechanical efficiency
Strength
Lightness
Quietness in operation





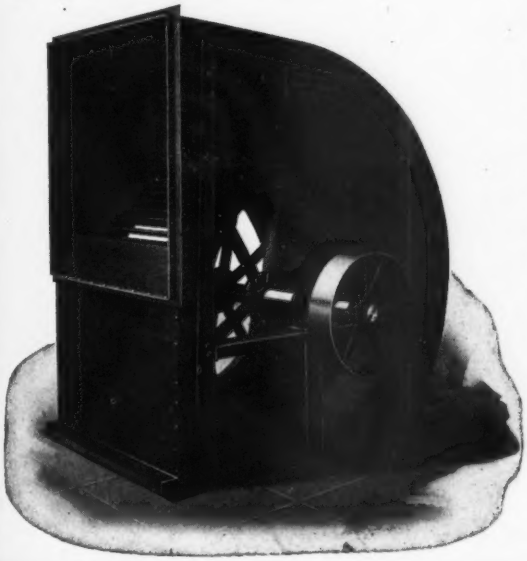
A method of construction equally adaptable to high as to low pressures and as practicable for double-width as for single-width fans.

Our Bulletin 17-V is a handbook on fan design
Sent on request

**BAYLEY MFG. CO., Milwaukee, Wis.**

# Buckeye Multiblade Fans

are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.



CORRECT DESIGN. HEAVY CONSTRUCTION. NOISELESS OPERATION. WORKMANLIKE FINISH. HIGHEST EFFICIENCY.

Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

THIS DEPARTMENT IS FREE TO YOU.

We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

*Write us*

**BUCKEYE BLOWER CO.**
COLUMBUS, OHIO

manufacture humidifiers and ventilating apparatus. Incorporators: George W. D'Arcy, Boston; Walter E. Pendleton, Bath, Me.; and John C. Pendleton, Brookline, Mass.

**Hamilton Thermometer Co.,** Hamilton, O., capital $50,000, to manufacture commercial and industrial thermometers. D. H. DeArmond is president of the company.

**York Heating and Ventilating Corporation,** York, Pa., capital $50,000, to manufacture sheet metal products. The principal stockholder is Frank S. Muzzey, 7320 Bryan St., Philadelphia.

**M. J. Fahey & Sons, Inc.,** Waterbury, Conn., capital $10,000, to conduct a heating, plumbing and sheet metal business. Incorporators: M. J. Fahey, John J. Fahey and Richard N. Fahey, all of Waterbury.

**Hohmann-Nelson Co.,** Portland, Me., incorporated to manufacture temperature-controlling apparatus. President, E. Conner; treasurer, H. I. Smith, secretary, A. B. Farnham.

### Central Station Heating Notes.

**Gary, Ind.**—A further extension of the central heating franchise has been made by the city council, carrying it to September 1, 1919. The franchise was first granted in 1914, but up to date but two blocks of pipe have been installed. Henry Vossler, Ingwald Moe and C. H. Maloney are the holders of the franchise. The war has prevented the financing of the company which was to put up the plant. It is now believed that the grantees can dispose of the necessary bonds and proceed with the construction work.

### Contracts Awarded.

**Currie-Simpson Co.,** Waterloo, erecting central heating plant for the State Hospital at Independence for $40,000.

**Smith & Wells Heating and Ventilating Co.,** Springfield, Mo., heating and ventilating new Y. M. C. A. building at Joplin for $23,927. Other bids were. Cunningham Plumbing Co., Kansas City, $25,850; Elliott and Barry, St. Louis, $29,356; Holtman Heating Co., Kansas City, $25,919; Sell-Orr Heating Co., Independence, Kan., $26,883; Smith and Wells, Springfield, Mo., $23,927; Hamilton Plumbing and Heating Co., Joplin, $28,900; Minor D. Woodling, Kansas City, $23,992; W. G. Cornell, Chicago, $25,000.


**BI-CAL-KY Ventilators**

No power bills with this fan. The air that passes over your building furnishes the power to ventilate it.

We Guarantee Results

Write for information

BICALKY FAN CO.
Buffalo, N. Y.

**RIC-WIL Paint for Heated Surfaces**

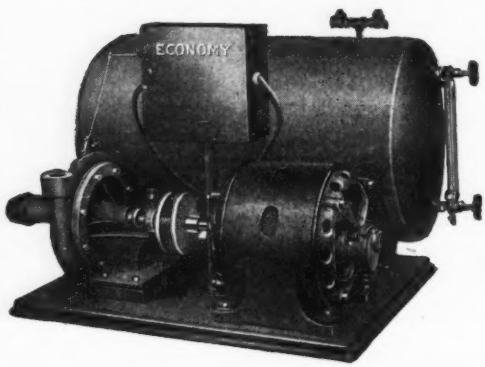
A brilliant black paint of superior preservative properties, dries hard yet is tough and elastic. It has a bond with clean metal that preserves its adhesion during contraction, expansion and bending.

Lasts Much Longer than the Average Coating.

Especially Good for Underground Heating Pipes.

Let us send You a Free Sample to Test.

THE RIC-WIL COMPANY, Cleveland, O.




**Automatic Electric Condensation Pump and Receiver**

*The Best Pump for the Least Money*

Automatically returns condensation from heating systems direct to boiler. Radiators on level with boiler room floor drained perfectly. Trapped connections in old systems kept absolutely free. Get results and save 25% in fuel and labor by using the Economy Condensation Pump. It will lift water from connections trapped as much as twelve inches, when so ordered.

We make all sizes of Return and Air Line Vacuum Pumps, Bilge or Sump Pumps, also Hot Water Circulating Pumps.

Write for "ECONOMY MANUAL A." Most complete Vest Pocket Heating, Ventilating Engineer's Hand Book.

ECONOMY PUMPING MACHINERY CO.
122 North Curtis St., Chicago, Ill.

# Westinghouse
## Ventilating Motors

### Not a Single Complaint in all New York

Although thousands of Westinghouse Ventilating Motors are installed in New York City, not a single complaint has been received from the users.

When your motors are selected by Westinghouse Engineers, installed under Westinghouse supervision and inspected after installation by Westinghouse Service Men, they can always be depended on for years of continuous operation with no more than ordinary care and attention.

**WESTINGHOUSE ELECTRIC & MANUFACTURING CO.**
**East Pittsburgh, Pa.**

## WANTED.

**Representative Wanted.**—A manufacturer of a full line of cast-iron boilers wants a representative familiar with the heating trades in Massachusetts, Rhode Island and northern Connecticut. Headquarters in Boston. One residing in Boston preferred. Make application in writing, stating experience and salary. Address Eastern, care of Heating and Ventilating Magazine.

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## JONES' HEAT TRANSMISSION TABLES

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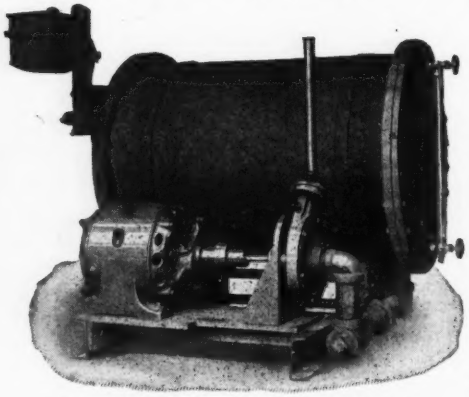

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